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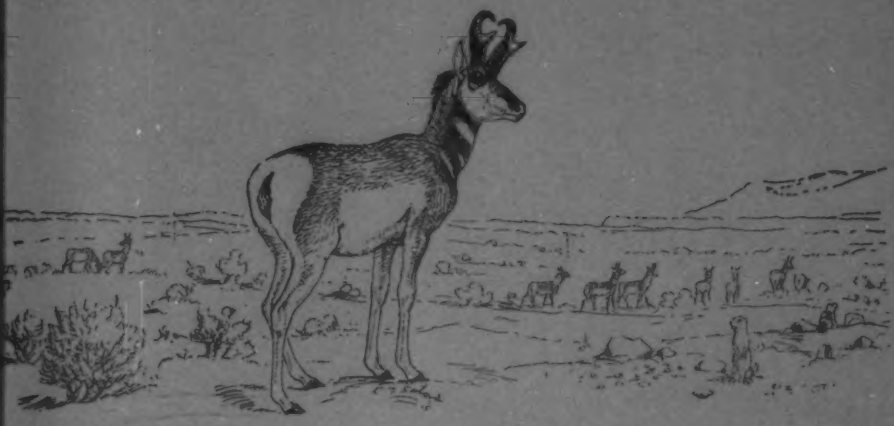

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# JOURNAL OF MAMMALOGY

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## RARE MAMMALS OF THE PRIBILOF ISLANDS, ALASKA


BY G. DALLAS HANNA


[*Plate 23*]

The commercial importance of the Alaska fur seal herd is so great that other mammals of the Pribilof Islands, equally interesting scientifically, are often overlooked entirely, or at best receive but very brief mention. Nevertheless the facilities for study and observation there are unsurpassed elsewhere in Alaska so that it seems desirable to keep records of all wild life as nearly up to date as possible. It is therefore proposed at this time to present some notes on the rarer species of mammals; these have been made from time to time during a seven year sojourn in that northern locality. A full list of the species would here be out of place since True[1] and others have listed them, and Mr. Edward A. Preble has recently published an extensive account of the fauna.[2]

### BEAKED WHALE

In his monograph of the beaked whales of the family Ziphiidæ True[3] gives a full history of the two specimens of *Berardius bairdii* Stejneger which were found and preserved on St. George Island in 1903. He mentions (p. 2) a third specimen found in 1909 which may not have been preserved. The object of this note is to call attention to the above record and to state that the species was not observed during my residence on the islands.

[1] Fur Seals and Fur Seal Islands of the North Pacific Ocean, vol. III, pp. 345–354, 1899.

[2] North Amer. Fauna, no. 46, 1923.

[3] Bull. 73, U. S. Nat. Museum, 1910.

### SPERM WHALE

In 1914 I recorded[4] the finding of a male sperm whale on St. George Island on April 14 of that year. This was apparently the first record of the species from the Pribilofs. The animal came ashore dead at Zapadni Rookery on the south side of the island and some portions of it were preserved for fox food. A later storm carried the carcass away.

In 1919 a female sperm whale floated ashore on St. Paul Island near Kitovi seal rookery. It was in an advanced stage of decomposition but some employees of the Navy Department towed it into East Landing to facilitate removal of the teeth for souvenirs. There it remained throughout the summer and fall, a disagreeable annoyance to all who had work at that place. Portions of the skeleton were still strewn along the beach in 1921.

Sperm whales are very rare in the shallow waters of Bering Sea; consequently they cannot often be expected at the Pribilof Islands. While it was supposed that both of the above mentioned animals had been injured in some way by the whalers it was impossible to make a definite determination of the cause of death.

### KILLER WHALE

While killer whales are very common about the Pribilof Islands in spring and fall it is not often that they come ashore, or that one can lay hands upon them. Being the chief, if not the sole destroyers of fur seals, whose skins would each year now bring in a revenue of more than a million dollars, they naturally have acquired the enmity of the residents of the islands. In the fall, schools of them cruise round and round the beaches in close formation, and actually devour fur seals by the hundreds. The official journals which are kept on the islands contain many accounts by eye witnesses of their depredations. I once saw two killers take three seals in five minutes.

The fall visit of the animals coincides with the period when the young seal pups are learning to swim and it is upon them that the greatest damage is wrought. At times however they have been seen to capture older animals. In the spring of 1917 a school of them maintained a stand between St. Paul Island and Sea Lion Rock and for more than a week succeeded in capturing or driving away practically every seal which approached the great breeding grounds in the vicinity.

[4] Proc. Biol. Soc. Washington, vol. XXVII, p. 218, October 31, 1914.

In their eagerness to capture their prey, killers often come inside the the line of breakers and on rare occasions they "run ashore." This happened in the fall of 1911 on St. Paul Island (see plate 23) and again in the spring of 1921. Also in the fall of 1913 one came ashore on St. George Island but it was supposed that this may have been an animal which I shot a few days previously. It was seen chasing pups, almost beneath my feet as I stood upon the edge of the cliff of Village Cove. Three Springfield bullets placed just in front of the dorsal fin failed to stop the animal at once but it was seen to flounder a short distance from shore.

It was from animals which ran ashore that Capt. F. W. Bryant made his classic records of 18 and 24 seals respectively, taken from the stomachs of two killers, $2,000 meals for each of them.

That the killer is enormously destructive of seal life is unquestioned and that the damage is increasing is very likely. The supply of whales upon which they depend for a certain amount of food is being rapidly depleted through the activities of commercial interests, thus, perhaps, causing the taking of more fur seals. It seems that the whalers have found commercial use for practically every other species of whale in existence except the killers but for some strange reason these are left unmolested. Even the small porpoises and belugas are hunted with profit. It is hoped that the full significance of this situation will soon become apparent to the proper government officials concerned, and if practicable, that a bounty be placed upon the heads of the killers.

### PORPOISE

*Phocæna phocæna* (Linnæus) or *P. vomerina* Gill if the Pacific form is regarded as distinct. The common harbor porpoise was first recorded from the Pribilof Islands by True[5] as *Phocæna communis* Lesson. His determination was made from a few bones which were picked up on the beach at Northeast Point of St. Paul Island in 1890. On July 19, 1916, an almost perfect male specimen of this species was found by me on St. Paul Island and again at Northeast Point. The only missing portion was the left pectoral which had been partially eaten by foxes. The back was dark slaty black which merged gradually into the milky white of the belly. The characteristic narrow black line ran from the angle of the mouth to the pectorals. It had not been long dead and apparently

[5] Fur Seals and Fur Seal Islands of the North Pacific Ocean, vol. III, p. 353, 1899.

had been killed in a collision with some object because the anterior end of the rostrum was badly fractured. The skeleton has been deposited in the U. S. National Museum from which the identification was obtained.

On account of the rarity of the species at the locality the above specimen was very highly prized and carefully cared for. My surprise may well be imagined when on February 2, 1917, an entire school of porpoises was trapped in the Village Cove of St. George Island by drift ice and literally shoved ashore. Thirteen were found, either out on the rocks of the beach or the ice cakes, high and dry. Many of them were still alive when the good old native hunter, George Merculieff, led us to them. The blue foxes had no fear of them and had begun to eat the flippers and flukes of several. It was noticed that the animals gave a very "pig" like grunt when they were being handled in transit to the village.

One of the animals was out on the ice cakes so far that it could not be reached, but all of the others were secured. Full measurements and weights were made and forwarded with the skeletons to the U. S. National Museum through the Bureau of Fisheries. The shipment included an embryo which attracted considerable attention because of its few short yellow whiskers.

The winter of 1916–17 happened to be one when an adequate fuel supply failed to reach us so the blubber from these porpoises was exceedingly welcome as an addition to the soggy drift wood in the stoves. The meat was too strong to be relished, even by the natives, but the village foxes were glad to get it.

While porpoises are common in certain parts of Bering Sea they are excessively rare about the Fur Seal Islands. This is shown by the fact that few of the natives had any knowledge of the "fish" whatsoever.

### WALRUS

I know personally of but two breeding rookeries of walruses in Bering Sea. One of these is in the eastern part on one of the group of Walrus Islands off Togiak Bay. The larger Hagemeister Island is near by. No people live on these islands and they are rarely visited. The other rookery is on Hall Island, the westernmost of the St. Matthew Group.

In 1911 I saw the first mentioned herd, or a portion of it, while marooned in the ice pack on a cannery steamer bound for Bristol Bay. It was estimated that 300 animals were in sight at one time. The Hall Island herd was seen in 1916 and roughly estimated at 500 animals.[6]

[6] Journ. Mammalogy, vol. I, no. 3, p. 120, May, 1920.

Walruses have been reported from the Pribilof Islands many times. Elliott[7] has given a vivid account of the species as it occurred there in 1872–1874. As late as 1890 eight animals were seen hauled on Walrus Island.[8]

During recent years none appear to have been seen there, but the island is under less regular observation. All accounts appear to agree that Walrus Island was never the location of a breeding rookery but was merely a hauling ground for surplus bulls. The fact that none of the skulls I saw about the place were of females would corroborate this statement.

That side of St. Paul Island which faces Walrus Island was likewise a hauling ground during early occupancy by the fur seal hunters. Doubtless the establishment of a village there caused the animals to desert the place. Elliott[9] cites a report of 1805 by the Russian Gavrila Sarietschev, as authortiy for the statement that 28,000 pounds of ivory had at an earlier date been taken on the Pribilofs in a single year. This is the equivalent of 4,000 or more animals. From the investigations which I once made in regard to the extent of the bone deposits at North East Point I am convinced that so large a number of walruses has never been taken there altogether. While the bones of the animals are more or less generally distributed about "The Point" they can scarcely be called abundant in any place when comparison is made with sea lions and fur seals. And since the bones of females are excessively rare it is inferred that this was merely a hauling ground for the males the same as Walrus Island. Drifting sand has now covered the old beach line where they once hauled so that it is now possible to find ivory with any degree of certainty only by digging.

Almost every year dead animals are found on the shores of the Pribilofs. They may be freshly dead or in various stages of decomposition. The evidence is conclusive that they "float" in. It has been my good fortune to be able to examine the carcasses of three of these and in each case death had been caused by crushing of the body cavity. At first the dead animals were supposed to be the result of surreptitous shooting but this could not be verified in a single instance. Since many of the animals stay along the outer line of the ice pack they probably occasionally get wedged between cakes in a storm and are killed. The great-

[7] Monograph of the Fur Seal Islands of Alaska, Spec. Bull. U. S. Fish Comm., pp. 92–101, pls. XXI, XXIV, 1882.

[8] True, Fur Seals and Fur Seal Islands, vol. III, p. 354, 1899.

[9] Ibid. p. 93.

est number of animals found dead in a single season of late years has been four, but about 1907 five were found at Garden Cove, St. George Island, at one time.

Live animals are not now often seen. In 1914 three were reported as having been sighted along the shores of St. George Island.[10] And in July, 1918, a young male was found sleeping listlessly in the surf wash on North Rookery of that Island. Great care was taken to approach sufficiently close for a photograph but finally I stood up in the open, snapped the picture shown herewith and walked boldly away without disturbing the peaceful slumberer. Next morning he was gone.

### BEARDED SEAL

The huge bearded seals (*Erignathus barbatus*), or mukluks of the Eskimos, seem to range up and down the east coast of Bering Sea in considerable numbers but they almost never venture out to the central islands. Mr. C. E. Crompton was fortunate, however, in 1918, in securing a specimen on January 20, on St. George Island. The specimen was forwarded to the National Museum through the Bureau of Fisheries but it is not certain that the measurements which Mr. Crompton took accompanied it. Therefore they are given here. All dimensions are in inches and taken with tape measure.

| | |
|---|---|
| Total length, nose to tip of tail | 93 |
| Length from nose to tip of hind flipper | 104 |
| Nose to armpit | 27 |
| Nose to eye | 5 |
| Nose to ear | 8 |
| Distance between eyes | 3 |
| Distance between ears | 7 |
| External auditory meatus, diameter | ¾ |
| Length of tail | 7 |
| Length of longest bristle | 4½ |
| Length of fore flipper, external | 12 |
| Width of fore flipper across phalanges | 6¼ |
| Length of hind flipper, external | 17½ |
| Width of hind flipper at tarsus | 5 |
| Width of hind flipper, spread | 17 |
| Average length of nails, fore flipper | 2½ |
| Distance between tips outstretched fore flipper | 51 |
| Girth of neck, behind ears | 28 |
| Girth, over shoulders | 54 |
| Girth, behind fore flippers | 90 |
| Girth, in front of hind flippers | 40 |

[10] Proc. Biol. Soc. Wash., vol. XXVII, p. 218, October, 1914.

KILLER WHALE ASHORE ON ST. PAUL ISLAND, ALASKA, FALL OF 1911
Photograph by M. C. Marsh

WALRUS SLEEPING IN THE SURF ON ST. GEORGE ISLAND, ALASKA, JULY, 1918

(Hanna: Mammals of Pribilof Islands.)

The sex of this animal was apparently not recorded. It had been shot at East Rookery by a native, Andronic Philomonoff. The skull was very remarkable in that it had lost all teeth; but the infirmity apparently did not interfere with the ability of the animal to secure a sufficiency of food because it was very fat.[11]

This may not have been the first appearance of the bearded seal on the Pribilof Islands because in 1916 a native of St. George reported to me that in 1900 several very large hair seals, 8 to 10 feet long were found on the beach. The heaviest drift ice during American occupancy of Alaska surrounded the islands that year and this might account for the presence of the animals. No specimens appear to have been preserved.

### SEA OTTER

Sea otters were common at the Pribilofs when the islands were first visited but they soon disappeared as a commercial asset. Stragglers, however, continued to come, probably from the Aleutian Islands, as several records attest. As late as 1892 Michael Lestenkoff found one "dead" at Zapadni Rookery, St. George Island. It is recorded in the Official Log of A. W. Lavender for July 24 of that year. The skin was sold for about $100 which became a bank deposit from which the native continues to draw interest.

True[12] mentions the finding of an animal "dead" at Rocky Point, St. Paul Island, in the spring of 1896 by a native, and skulls are occasionally found in the sand dunes. True mentions two and I found one in 1915 which was sent to the National Museum.

Although the species has been protected since 1911 by international treaty it still is exceedingly rare at its former stronghold, the Aleutian Islands. Whether any ever visit the Pribilof Islands nowadays is questionable but in one case on St. Paul Island in 1918 a native, Peter Oustigoff, described an animal to me which he had seen near the Reef and which could hardly be other than a sea otter. But since the man had impaired vision it was feared that imagination had something to do with the occurrence and it was not believed to be entirely reliable.

How fortunate indeed it would be if on Otter Island of the Pribilof Group there could be established such a colony as the Russians have maintained on Copper Island for more than 100 years.

*California Academy of Sciences, San Francisco, Calif.*

[11] This specimen was mentioned in Alaska Fishery and Fur-Seal Industries in 1920, Bureau of Fisheries Document no. 909, p. 126, 1921.

[12] True, Fur Seals, etc., p. 354.

# TRADE NAMES IN THE FUR INDUSTRY

By Frank G. Ashbrook

It is commonly known to many wearers of furs that the "misnaming" of these articles of apparel dates back to the very inception of the fur trade. Reliable fur merchants, however, those who thoroughly understand the details of their business and have a proper sense of responsibility and an ambition to establish a reputation for honorable competition and fair dealing with customers, have always informed prospective buyers what the trade name of a fur under consideration really means and from what animal the fur comes.

In London opposition to this system of misnaming became so strong as to lead the London Chamber of Commerce to give notice that misleading terms could not be used and that offenders would render themselves liable to prosecution under the Merchandise Marks Act of 1887. The question is still a live one in England, and the London Fur Trade Association has launched a vigorous campaign against the practice.

While there is no drastic law in the United States covering this form of deception, the question is being given earnest consideration not only by fur trade associations but by the National Vigilance Committee and its affiliated Better Business Bureaus.

The subject of truthfulness in fur advertising occupied an important place on the program of the convention held in conjunction with the First International Fur Exposition in New York City on May 7, 8 and 9, 1923. It is to the best interests of the fur trade that definite action be taken by its representatives to rid the industry of what is actually a menace to its future, and to encourage the advertising of furs so that the public will be informed truthfully as to the kind and quality of skins from which any particular garment is made.

The so-called misnaming of furs had its inception in a natural desire on the part of certain manufacturers to distinguish their products from those of their competitors. In the hands of unscrupulous dealers, however, the practice developed into plain deception. The subject resolves itself into the three following phases, each of which requires clear thinking before a satisfactory solution of the whole problem can be found: (1) Trade names; (2) psychology of salesmanship; and (3) plain deception.

## TRADE NAMES

If the misnaming of furs is ever justifiable it is in the case of manufacturers and dyers who create trade names solely for the purpose of

differentiating their products from those of their competitors. These trade names have always been regarded as having been invented to describe certain grades of fur and to cover all those which correspond sufficiently to be included in the finished product under one trade name. Thus in the past few years rabbit, sheared and dyed to resemble seal, has appeared under the following trade names: Near seal, electric seal, Red River seal, bay seal, polar seal, Arctic seal, northern seal, French seal, new seal, Baltic seal, American seal, LaMeuse seal, Semeuse seal, Geller seal, and Two-L seal.

A manufacturing furrier or dyer who is able to transform a rabbit pelt into an extraordinarily good product takes pride in giving this product a trade name which will protect it and distinguish it from a dozen other such products which may be on the market. A trade name rewards the manufacturer for his skill by the increased demand for that particular product. On the other hand an inferior product can be removed from the market as quickly as it comes on, if such a course becomes advisable.

So long as the public is not deceived by a trade name there can be no objection to its use. If trade-named furs are sold to retailers presumably there is no deception; but this is not the case when the fur is sold to the public under the trade names without proper information as to its source.

## PSYCHOLOGY OF SALESMANSHIP

It is common knowledge among all trades that a certain class of buyers like to be fooled. To such people eggs at 30 cents a dozen are not nearly so palatable as those at $1.00 a dozen from the same crate. The same principle is applicable to the fur trade. A person who could not be induced even to look at a garment made of cat or rabbit at $50 to $75, will be charmed with the same coat when it is called ocelot or French seal, and priced at an advance of $100.

These examples are not cited to justify the misrepresentation of furs by dishonest retailers, for cat and rabbit will wear like cat and rabbit, neither better nor worse, under any trade name given them.

## PLAIN DECEPTION

It should be remembered that furs misnamed are always inferior to the articles under whose titles they masquerade. The chief offender in the misnaming of furs is the retailer, and his action is taken for the purpose of increasing sales and obtaining larger profits than could be

secured if the same furs were sold under correct representation. He wishes to gain a reputation for dealing in goods of better quality than are actually handled. All this is designed to catch "suckers."

A merchant of this type would sell to an unsuspecting buyer a "pointed" fox for a silver fox, the pointed fox being a red fox dyed black, with badger hairs stuck in and a white tip sewed on the tail. Another example would be the sale of a Hudson Bay "sable," which is really marten, under the name of Russian sable. Law suits have been instituted in various sections of the United States by purchasers who have been defrauded by the substitution of electric "seal," which is clipped and dyed rabbit, for Hudson "seal" which is made from plucked and dyed muskrat.

The following list of misnamed furs as used by the fur trade has been compiled by the Biological Survey:

LIST OF MISNAMED FURS

| *Trade Name* | *Real Name of Animal* |
|---|---|
| Adelaide chinchilla | Australian opossum |
| Alaska bear | Raccoon (dark pelts) |
| Alaska sable | Raccoon (dark pelts); skunk (natural black or dyed) |
| Aleutian seal | Muskrat (plucked and dyed) |
| American seal | Rabbit (plucked and dyed) |
| Arctic seal | Rabbit (plucked and dyed) |
| Astrakan, Astrachan | Persian lamb (loose curl) |
| Australian fisher | Wallaby (sheared and dyed) |
| Baltic fox | Northern hare |
| Baltic seal | Rabbit (clipped and dyed) |
| Bear | Goat (dyed) |
| Beaver | Coypu rat (plucked natural); or opossum (sheared and dyed) |
| Black furs | Black cat |
| Black lynx | Northern hare (dyed) |
| Black marten | Skunk (dyed or natural black) |
| Blue Japanese wolf | Goat (dyed) |
| Brazilian mink | Marmot (blended) |
| Broadtail | Persian lamb (moire silk pattern) |
| Brown Newfoundland seal | Seal (brown hair) |
| California mink | Ringtail cat |
| Cape seal | Rabbit (sheared and dyed) |
| Caracul, Karakule, Caracool | Persian lamb (close curl) |
| Cat | Rabbit (sheared and dyed) |

| | |
|---|---|
| Civet cat | Small striped skunk; or hydrophobia skunk |
| Chinchilla | White rabbit (dyed) |
| Clipped seal | Rabbit (plucked and dyed) |
| Coney | Rabbit |
| Electric seal | Muskrat (plucked and dyed); coypu rat (plucked and dyed); rabbit (sheared and dyed) |
| Ermine (weasel) | White rabbit |
| Fitch | European polecat |
| Fox | Hare (dyed) |
| French sable | Rabbit (dyed) |
| Geller seal | Rabbit (plucked and dyed) |
| Genet | Cat |
| Hudson Bay seal | Muskrat (plucked and dyed) |
| Hudson seal | Muskrat (plucked and dyed); coypu rat (plucked and dyed); rabbit (sheared and dyed) |
| Isabella fox | Domestic dog (dyed and curled) |
| Japanese lynx | Black Manchurian dog |
| Karakule kids | Kid (dyed) |
| Koala | Wallaby (sheared and dyed) |
| Kolinsky | Red sable, or Siberian mink |
| Krimmer | Gray lamb skin resembling astrachan |
| LaMeuse seal | Rabbit (plucked and dyed) |
| Mink | Marmot (dyed) |
| Mole | Muskrat (sheared and dyed) |
| Monkey | Goat (dyed) |
| Muskrat | Rabbit (sheared and dyed) |
| New seal | Rabbit (plucked and dyed) |
| Northern seal | Rabbit (plucked and dyed) |
| Nutria | Coypu rat |
| Patagonian bison | China sheep (short haired) |
| Persian lamb | Domestic dog (dyed and curled); kid (dyed) |
| Persianer | Persian lamb (close curl) |
| Pointed fox | Red fox dyed black, white badger hairs stuck in, and white tip sewed on tail |
| Polar seal | Rabbit (plucked and dyed) |
| Real Russian sable | American marten (sable); Hudson Bay marten (sable) |
| Real seal | Muskrat (plucked and dyed) |
| Red River Seal | Muskrat (plucked and dyed); coypu rat (plucked and dyed); rabbit (sheared and dyed) |
| River mink | Muskrat (blended) |
| River sable | Muskrat (natural) |
| Russian otter | Muskrat (blended) |
| Semeuse seal | Rabbit (plucked and dyed) |
| Sable | Hare (dyed); marmot (dyed); mink (dyed); rabbit (dyed); Norwegian fitch (dyed) |
| Sable Fitch | Norwegian fitch (dyed) |
| Seal | Coypu rat (plucked and dyed); otter (plucked and dyed) |

| | |
|---|---|
| Seal Musquash | Rabbit (sheared and dyed) |
| Sidney raccoon | Wallaby (sheared and dyed) |
| Skunk | Marmot (dyed); wallaby (dyed); opossum (sheared and dyed); wallaby (sheared and dyed) |
| Two L seal | Rabbit (plucked and dyed) |
| White fox | Northern hare |
| Wombat | Koala |

## CONCLUSIONS

The business in furs has developed so rapidly during the past ten years that department stores handling cloaks and suits have had to include fur garments in order to supply their customers. So rapidly has the business grown that it has been impossible in all cases for these shops to obtain the services of trained buyers and sellers. Many of the people selling furs to-day are simply graduates from the ribbon counter, who have no technical knowledge of the value and quality of furs. They handle only the products of their manufacturers and are obliged to depend entirely upon the representations made by them.

The retailer is the man upon whom the purchaser must depend for a square deal. The necessity of considering the responsibility of the dealer when purchasing furs must be apparent. The common and cheaper furs are often so prepared as to resemble rare and costly articles. To become an expert in judging furs requires years of training and experience, and even an expert may be fooled sometimes. The question that now naturally arises is: If an expert may be misled what chance has the customer? The answer is that the average customer is not in position to learn enough about furs to judge for himself. The safest course to follow in the purchase of furs is to deal only with a furrier who can be trusted both as to knowledge of furs and as to business integrity.

There is no justification for misnaming furs, no matter how mild the deception. The time is opportune for fur trade organizations to take definite action to rid the industry of this menace. These organizations, therefore, should cooperate with advertising clubs, chambers of commerce, and state legislatures to bring about the enforcement of a law to stop deception in the fur trade. Such a law could be similar to the "truth in fabrics" law fostered by the National Wool Growers' Association, or to the English Merchandise Marks Act, previously referred to in this article.

*Biological Survey, Washington, D. C.*

# STUDIES IN MAMMALIAN NEUROPATHOLOGY. I. CEREBRAL CHOLESTEATOMA IN THE HORSE

By Stanley Cobb, M.D.

[*Plate 24*]

Brain tumors are not uncommon in the horse, but they usually are of such small size as to cause no symptoms. The kind of growth usually found is the cholesteatoma, a tumor arising from the choroid plexuses in the cerebral ventricles. These tumors are usually incidental postmortem findings having caused no symptoms during life. They are, as a rule, little larger than a pea, but even when large have grown so slowly as to cause no damage. The cases described in the literature[1] have given such symptoms as drawing of the head and neck to one side, falling, and convulsions. The present case is of interest because of the severe symptomatology, probably due to hydrocephalus, and because two tumors were found, one in each lateral ventricle, arising from the choroid plexus.

## CASE HISTORY

The animal in question was a mare six years old, named Obar; she was from Arabian stock and her pedigree was thoroughly known, so the immediate antecedents were known to be horses in good health who lived to a normal age. In the spring of 1921 when this mare was six years old she began to have attacks of unconsciousness; these would be initiated by restless moving about her stall, after which her head and neck would seem to be pulled to the left. She then would walk toward the left, circling around and around the stall until she suddenly fell unconscious. There were no marked convulsive phenomena noticed. After the first of these attacks her owner naturally stopped using her as a saddle-horse and she was kept under observation by the veterinary for the rest of her life. The attacks became more frequent and more severe. In June of that year it was decided that she must have a cerebral lesion, causing epilepsy. The veterinaries therefore recommended killing the animal and the author was asked to perform an autopsy.

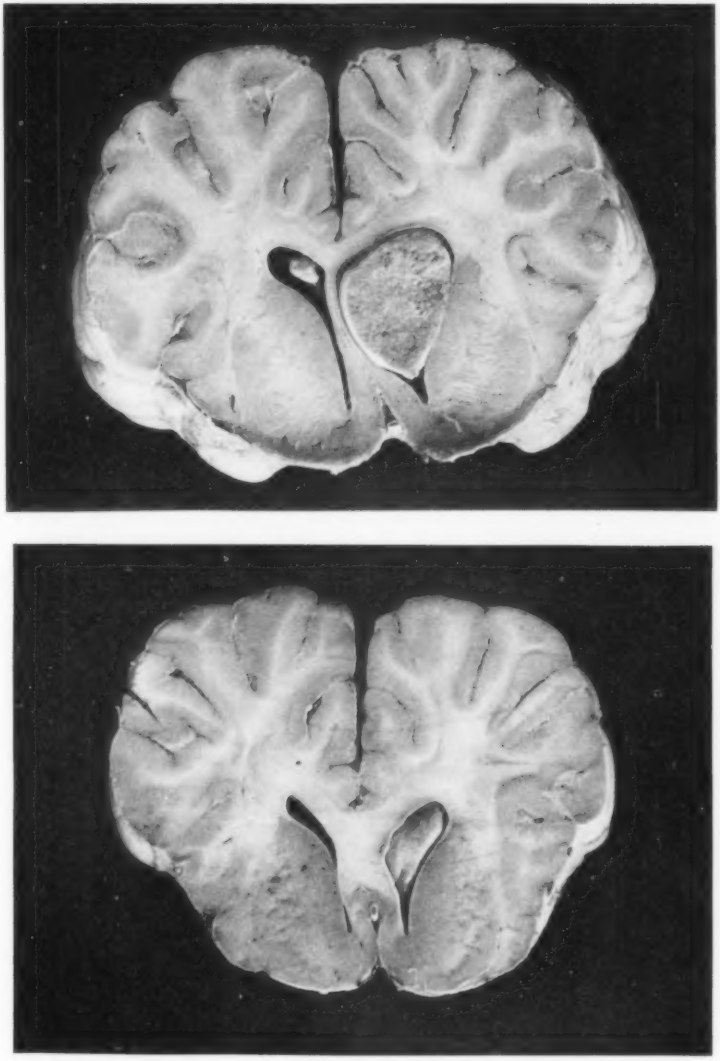
Autopsy performed at Ward's Island June 10, 1921: In a general examination of the body no abnormalities were noted. The abdominal

[1] The term cholesteatoma is used here in accordance with the classification of continental veterinary writers. (See: Hutyra and Marek—"Pathology and Therapeutics of the Disease of Domestic Animals;" Chicago 1913, p. 656.)

cavity was opened and nothing unusual found. The skull was trephined and then rongeured away until the brain could be removed whole. Externally the brain showed no abnormality. The dura and pia arachnoid membranes were smooth and glistening; the blood vessels appeared normal. After removing the dura inspection of the surface of the brain showed that the left hemisphere was slightly larger than the right. The whole brain was put into 10 per cent formalin to harden.

Ten days later the hardened brain was sectioned, making parallel transverse cuts through the cerebrum. After having removed the hindbrain by cutting the cerebral peduncles the first section revealed a large hard tumor lying in the left cerebral ventricle. In cutting through this mass the knife met with much resistance, giving a gritty sound. At that time no further cuts were made but a piece of the tumor was removed for microscopical study. After photographing these gross sections (see plate 24) the brain was once more cut in parallel transverse sections, in order to determine more exactly the anatomical location of the tumor. It was then discovered that there were two tumors, the larger one lying in the left lateral ventricle, extending well forward into the frontal horn and backward to a point just above the anterior limit of the optic thalamus. This tumor is about the size of a pigeon's egg (the actual measurements being 4 cm., by 2 cm. at the widest point), while the tumor in the right ventricle is much smaller, less rounded in outline and resembles a small, irregularly stuffed sausage (17 mm. long, by 6 mm. in an average diameter). Further dissection revealed that each of these tumors was firmly attached to the velum interpositum and the choroid plexus. They were in no way connected with each other except by the velum.

The tumors were of a deep purplish red color and were covered with a smooth glistening capsule. On section they appeared granular and were very hard in some places, in other places the consistency being merely tough. The hardness seems to arise from small granules scattered thickly throughout. The upper figure shows the appearance of the cut surface of the tumor; in the right ventricle, the end of the small tumor is just apparent, not having been touched by the knife. The lower figure shows the rounded end of the larger tumor in the left lateral ventricle, with its smooth glistening capsule. The only other abnormality in the brain is the marked dilatation of the lateral ventricles. This is obvious about the large tumor, but also extends back into the occipital horn behind this tumor, the foramen of Munro being blocked on this left side. The tumor in the right lateral ventricle also partially occluded



BRAIN TUMORS IN A HORSE

(Cobb: Mammalian Neuropathology.)

the foramen of Munro, causing a moderate internal hydrocephalus on this side as well.

Microscopical sections of the tumor showed masses of irregularly placed bundles of collagen fibrils. Between these bundles are holes where cholesterin crystals have been lying, but have fallen out in the preparation of the specimen. There is a marked increase in the connective tissue about the blood vessels. These blood vessels are fairly evenly distributed and are not found in great numbers, but many seem to be engorged, and some show calcification of their media, in other words we have an old tumor with a chronic inflammatory reaction about cholesterin crystals. This is the type of tumor which usually arises from the choroid plexus and is known as cholesteatoma.

## EXPLANATION OF PLATE 24.

### UPPER FIGURE

From the first section through horse's brain, about midway between the frontal and occipital poles. Showing a large tumor lying in the left lateral ventricle, its cut surface appearing rough. Around the edge is seen a smooth glistening capsule. In the right lateral ventricle, which is dilated, is seen the anterior end of the smaller tumor, which extended backward into the occipital horn of the ventricle. There is marked displacement of the brain substance, especially the corpus callosum, and the septum lucidum. The left hemisphere appears slightly larger than the right.

### LOWER FIGURE

Section of brain parallel to that illustrated in upper figure, but about 2½ centimeters anterior to it. Here is seen the smooth rounded end of the tumor whose cut surface appears in the previous figure. The irregularities of the surface are also noticeable, and the hydrocephalus is conspicuous.

*Boston, Mass.*

# LOCAL WALRUS PROTECTION IN NORTHEAST SIBERIA

By Joseph F. Bernard

[*Plate 25*]

In the fall of 1921 I had the misfortune to be shipwrecked on the coast of Siberia. After we were established in winter quarters, I spent as much time as possible in the villages, gathering folk lore and other information about the lives of the natives.

Ingshong, about twenty miles from East Cape, is the most prosperous village I have seen among the Chukchees; that is to say, the inhabitants of this village always have plenty of walrus meat to eat, walrus hides for their dwellings and boats, and oil for fuel and lighting. My host at Ingshong was a Chukchee known when I was along the coast eighteen years before as Masinka Sam. I won the confidence of Sam and his friends to such an extent that they freely confided in me their religious beliefs and superstitions. And so I heard the story why, when the other villages fare poorly, the walruses come in such numbers to the beach near Ingshong.

It was not always this way with Ingshong, for, when I used to come along the coast eighteen years ago, the village was small, only four houses, and the walruses did not come in great numbers as they do now. Now the village has grown to twenty houses and thirty families, and there is a wise chief there named Tenastze, who is the wealthiest and best known chief along the whole coast. I asked Sam one day how it happened that Tenastze, whom I had known as an ordinary hunter in the years gone by, had risen to the position of chief. Sam told me this story:

Along about twelve years ago after the hunt had been a failure for several years, Tenastze called a meeting at his house of all the men of Ingshong and also the men of the neighboring villages. Addressing the meeting, he made a long talk, in which he said that in the days of long ago this place had been a good hunting place, and had had many great chiefs who were fine hunters. In those days the walruses came on the beach to sleep in countless numbers, but of late years the walruses seemed to go to other places.

In his opinion there was no one in the village who was looking after the spirit of the walrus. He believed something had to be done and that the medicine men of the village should call upon their various spirits to

find out what had offended the spirit of the walrus. Among the villagers there were five men who were supposed to be medicine men, able to communicate with spirits. The five men got together and each one took a drum and beat it for awhile and went off into a trance. When they came to their senses they all seemed to tell the same story, that somebody in the village had offended the spirit of the walrus and that the land was poisoned. But this evil spell could be broken, provided that a strong and willing man be appointed chief, who would promise to guard the spirit of the walrus carefully.

None of the five medicine men had any idea who this strong and intelligent man was who ought to be chief. They decided to let the decision rest until they had killed the first walrus of the season. Everybody went to work hunting on the ice with their skin boats to find a walrus as soon as possible.

The first walrus was killed the next day. They took off the head and went to a meeting place on the edge of the village. All the men gathered in a circle. Inside the circle the chief shaman took a seat. They tied the walrus head on the end of a long stick. Each man in his turn was called upon to lift the heavy load at the end of the stick stretched out in front of him at right angles to his body. The man who could lift the head the easiest was considered to be the one who had offended the spirit of the walrus the least, and the one for whom the spirit would answer questions most willingly.

Then the medicine man would put the questions to the walrus head. If the head seemed to rise from the ground easily, the answer was "Yes." If the head rose heavily and but a slight distance, the answer was "No." Some of the questions that the walrus head answered in the affirmative were: (1) Should there be a chief at Ingshong? (2) Should the chief have absolute control of the walrus? (3) Should offerings be made annually to the spirit of the walrus? (4) Should the offerings be walrus heads, one of which should be thrown out to sea?

Then came the question who was to be chief. They started to name all the men of the village. But the head would signal "No," until Tenastze's name was called. At this the head went right up into the air as light as if it were a feather. Everyone jumped up and shouted, glad at this choice for a chief.

Now since that time Tenastze had led the tribe in the ways of superstition, it is true, but these ways had proved to be the ways of wisdom.

Tenastze had first of all a guard appointed who watched day and night to see that the tabus affecting the walrus were not broken, nor the walruses disturbed when asleep on the beach after they had hauled there in September. Also after the first walrus appeared, there was no more fire in the village until the end of the hunt. As a consequence the first walruses that came, even though they later went out to sea for short trips, returned to the beach where they had been undistrubed. Not only that but they brought other walruses with them. It followed in the fall at the freeze up there were several hundred walruses on the shore. That was the time that a day was set for the kill. All the men went to the place at once and with a lance or harpoon each killed his allotted number. They killed only what they needed for the year's supply, and so many were permitted to go away unharmed that the herd returned next year in even greater numbers. Each year by these sane conservation methods the herd increased, until last year the beach was so crowded when the walruses hauled there, that many walruses were crushed to death just from overcrowding. The beach is about a mile long and fifty to seventy-five yards wide, a gravelly stretch of land bound by two points that extend out to sea. Back of the beach is a cliff that rises to a height of twelve hundred feet, and it is possible to descend this cliff in only one place at the south end. Down this narrow defile in hunting season the hunters come with the lances, ready to kill the walruses in the appointed manner. Sam said that last year the walruses were crowded for twenty feet up the face of the cliff where they found resting places on the narrow edges. They came in such droves that last year invitations were sent to the nearby towns of Utan, Whalen, East Cape and Emma Town for the hunters to come and share in the hunt at Ingshong.

As a comparison between the methods used at Ingshong and the methods used at other places, let us cite Point Hope on the Alaskan coast. Thirty years ago the walruses came in great numbers to Point Hope—by the thousands. The beach where the walruses hauled was near Cape Lisburne above the village of Point Hope. The traders and whalers and natives observed no regulations regarding the walrus. Any time they saw a walrus on the beach, they shot at it, and, if they did not kill it, scared it away. For the last twenty years it is seldom that anyone has seen a walrus on this beach.

A white trader sailed into the vicinity of Ingshong two years ago, and, not knowing the laws of the place, shot at the herd. He was imme-

VILLAGE OF INGSHONG, NORTHEAST SIBERIA, SUMMER OF 1922

The hauling place of the walrus is not shown, being hidden from the village by high land on near side of the picture.

PACIFIC WALRUSES, 50 MILES OFF CAPE SERDZE, NORTHEAST SIBERIA, ABOUT SEPTEMBER 1, 1922

Photos by Capt. Joseph F. Bernard

diately arrested by the guard, his vessel taken inside the lagoon near the village, and the Russian nachamik sent for from Whalen. When the nachamik arrived, the trader was made to pay a heavy fine. The walruses returned to the beach after two or three weeks, but Sam told me that if they had not returned, the villagers would have killed the trader for offending the spirit of the walrus.

Tenastze has such control over the village that during the season for hunting no one is allowed to get drunk. If he disobeys this regulation, he leaves the village forever. And so it happened that in the winter of 1921–1922 the village of Ingshong supplied natives as far south as Saint Lawrence Bay with meat. For in the other villages where such wise conservation methods had not been employed and where the walruses had been frightened by hunting with guns, the herds did not haul in such numbers. Moreover the hunters had been drunk during the season and had not taken advantage of the opportunity they did have. It is to be hoped that the wise and shrewd chief Tenastze will live long and be in power for many years.

*Montreal, Canada.*

# BIG GAME IN RHODESIA

By Wynant Davis Hubbard

I have just completed reading the able and vivid paper on the "Close of the Age of Mammals," by Osborn and Anthony, in the November, 1922, issue of the Journal of Mammalogy. Being at present engaged in the capturing alive of Rhodesian animals for zoological gardens, I have a peculiar interest in the discussion of the disappearance of certain African forms of wild life.

Mr. Herbert Lang is quoted as stating that the mountain zebra, bontebok, square-mouthed rhinoceros, okapi, black wildebeeste, kudu, and the Addo bush elephant are on the verge of extinction. The bontebok, okapi, black wildebeeste, and the elephant of the Addo bush I know nothing about from personal observation. The white rhinoceros, kudu, and the mountain zebra I do know, having just returned from a safari into the country in which these animals may still be found. With Mr. Lang's statement regarding the kudu I do not wholly agree unless it is meant to apply to the country south of the Zambesi River. Only two days ago while out hunting I saw four kudus and the tracks of at least fifty more. On my safari my companion shot kudus and they were, with the possible exception of sables, buffaloes, and zebras, the most plentiful of the large animals. Our trip was made at a very poor time of year, but in the two weeks we saw the spoor for at least one thousand kudus. Continued conversations and enquiries among the natives lead me to the conclusion that in this part of Rhodesia the kudu is, if not the second most plentiful large buck, certainly the third. The sable leads in numbers, and the roan may possibly come second.

From the information that I have at hand at present I should put the numbers of large buck in the following order: 1. sable; 2. kudu; 3. roan; 4. Lichtenstein hartebeeste; then, eland, blue wildebeeste, lechwe, impalla, puku, and bushbuck. The situtunga, waterbuck, and sessaby are scarce, the waterbuck being the most plentiful of the three. The impalla, puku, bushbuck, and lechwe are localized, found in large herds in some places and absolutely wanting in others.

Zebras are plentiful in certain types of country. In the foothills of the mountains of the Zambesi Valley escarpment near here there are large and numerous herds of the northern mountain zebra and on certain "flats" or large stretches of open country there are herds of a different zebra, presumably Burchell's, or *Hippotigris burchelli*. This variety has been split up into so many sub-varieties that it is nearly impossible

to say which sub-variety occurs here. Mr. Lang refers, I think, to *Hippotigris zebra* when he mentions the mountain zebra. This variety *is* on the verge of extinction, being limited to a few places in the mountainous regions of the Cape Colony. *Hippotigris crawshayi* is, on the other hand, not limited to a few places here, but is found rather widely distributed.

I hesitate to discuss the square-mouthed rhinoceros. It is difficult in the extreme to estimate or attempt to estimate the numbers of this animal. That there are quite a few at present living not far from here I know. Just how many there are it is impossible to say. In comparison with the black rhinoceros the white is not uncommon in certain places. In others, however, it is totally lacking.

The plea for game protection in Northern and also Southern Rhodesia will and does, I am afraid, meet with great and determined opposition. There are to my mind three main reasons for this; the lack of an adequate and constant supply of palatable fresh meat, the prices paid for hides and skins, and the lack of educated or thoughtful men on the farms. To elaborate on these reasons: The supply of meat which is necessary to any family is, in this tropical country, a vital and very difficult problem. Beef, mutton, lamb, pork, and veal as we in America know them, do not exist. Sheep tastes like goat, the beef is poor and tough, I have never seen veal, and pork is very scarce. Practically all of the farms are supposedly self-sufficient as regards food but the real situation, at least here, is that the farmers are so poor they do not dare to kill what pigs and cattle they may have; practically none have sheep, and, as a consequence, they depend for their meat supply on the game. What is the result? Ammunition is expensive and time is precious so hunting is confined largely or at least preferably to large bucks. The skin value of a sable, eland, or roan is also an attraction. Therefore large bucks are killed without a thought to the inevitable fact that at least two-thirds of the meat will go bad before it can be eaten. It is then either thrown to the dogs or pigs or sold to the natives, no one of the three needing meat.

Three days ago one of my neighbors shot in one day one large eland, one roan, and one hartebeeste. He was far from home at the time with the result that the greater part of all this meat was too rotten to eat before it reached the farm. These three splendid animals were killed not primarily for the meat, but for the small value of the skins, and because, as the shooter himself told me, the love of shooting (killing, I called it) was too great, and everything that was seen had to be shot at.

War was declared a few years ago on the sale of heads, skins, and plumes from game and other wild mammals and birds in the United States and Canada. In Rhodesia no hinderance is put upon it. All the small and large traders buy the skins and hides of the sable, roan, hartebeeste, wildebeeste, kudu, eland, buffalo, rhinoceros, and hippopotamus. Not much is paid for individual skins, usually not more than ten shillings, but for a man who shoots as recklessly as my neighbor the sum total of money received for skins amounts to quite a respectable sum for the entire year.

Another reason for the selection of large bucks for killing is the fact that practically no rope is to be found in use in this country. Buck skins are used for every conceivable purpose. All the thongs, whips, and straps necessary for the many spans of oxen are cut chiefly from the skins of bucks, which also go to the making of buckets, mixing-bins for cement, and shoes, the tying of grass on the house roofs, and any odd use to which they can be put in an emergency. As a consequence, on all the farms that I have visited, moldy half-skins of the sable, eland, roan, etc., are to be seen lying around useless for any real purpose. There is also a big demand for the heads of the rarer game species. This, of course, encourages their pursuit; whereas, for the purposes of meat or skins, any of the commoner species would do as well.

There is in Rhodesia, indeed in the whole of South Africa, a certain class that wages a continuous and ruthless war on game of all kinds. Farming is used by them as more or less of a pretext to cover the excessive amount of hunting which they do. I should judge, from what I have seen, that if their hunting were stopped or at least limited to what the law allows they would soon be bankrupt and foodless.

With the majority of the inhabitants so illiterate and thoughtless, it is difficult to see how to plan for protective game legislation and education. An extremely strict enforcement of the game laws and the infliction of the maximum penalties for the violation of the same would have some effect. But the sum total of Northern Rhodesia police force is only some seventeen men. It is not too late yet to save most of the species here, but forceful action of some kind must be inaugurated speedily or the chance will have passed.

*Tara, Northern Rhodesia.*

# ADDITIONAL REMAINS OF THE FOSSIL DUGONG OF FLORIDA

By Glover M. Allen

[*Plate 26*]

The remains of fossil sirenians hitherto discovered in North America and the West Indies have been extremely few and fragmentary, quite in contrast to the state of affairs on the east side of the Atlantic where, particularly in the area bordering the Mediterranean, a number of well-preserved specimens have been recovered sufficient to illustrate fairly well the osteology of some half-dozen genera.

The extremely dense and massive structure of the bones of at least the later Tertiary and modern species is very characteristic. The ribs particularly are in later forms of extraordinary weight and solidity, an adaptation, it has been suggested, for increasing specific gravity so as to enable the animals the easier to feed on the bottom at shallow depths. Dollo has even supposed that these enlarged ribs serve as a sort of internal armor, like a dagger-proof vest, though against what enemies, we do not know.

In Miocene times or earlier sirenians were found on our Atlantic coast at least as far North as Maryland whence Case (1904) records an unmistakable fused radius and ulna, as well as a rib fragment from the Calvert formation at Fairhaven. The arm bones, though of small size, he refers doubtfully to DeKay's (1842) *Manatus giganteus*, which was based on two very large vertebræ of uncertain identity, possibly cetacean. More recently the late William Palmer (1917) recorded the discovery of a fifth-cervical vertebra from the same formation, that is unlike the corresponding bone of the manatee but agrees completely, "except in [smaller] size" with that of the Steller's sea-cow (*Hydrodamalis*) from Bering Sea. These bones though occurring in Miocene strata are believed to be redeposited from eroded beds of an earlier, perhaps Eocene period.

Here may be mentioned also two other fragments, the identity of which, though still in doubt, may be with this order. One consists of a tooth fragment recalling the tusk of a dugong and forms the basis of Cope's *Hemicaulodon effodiens*. It came from the Eocene marl pits, Shark River, Monmouth County, New Jersey. The other is a tusk-like incisor in place in a fragment of a premaxillary from the phosphate beds of South Carolina. It was described by Cope (1883) as *Diplo-*

*therium manigaulti*. Rib fragments, evidently of Sirenia, are known from the Ashley River deposits and from the Santee Canal, South Carolina. Their precise age is uncertain. Leidy (1869) mentions such remains from Miocene and later formations of New Jersey, Virginia, North Carolina, and Florida. He also (Leidy, 1856) bestowed the name *Manatus antiquus* on a tooth larger than any molariform tooth of the living manatee but resembling one in form, discovered by Tuomey in the post-Pliocene of Ashley River, South Carolina. Its identity is still a matter of doubt, as is also that of the molar tooth named *Manatus inornatus* by Leidy (1873) which resembles so closely a tooth of the living manatee as perhaps to be actually of that animal. Fragments of fossil ribs found in Florida have also been referred to Leidy's *Manatus* (= *Trichechus*) *antiquus* and more recently Hay (1919) has described an imperfect lower jaw from the Pleistocene of that state as possibly representing the same species, though slightly smaller than the existing manatee. In the West Indies, two important discoveries have been made. The first was a skull of a somewhat primitive sirenian found in Jamaica in supposed Eocene deposits. It was described by Owen (1855) as a new genus and species, *Prorastomus sirenoides*. Later, Lydekker (1887) recorded a fragmentary humerus from the island of Sombrero, which he referred to the same species. The genus has been reported also from the Eocene of Italy (*P. veronensis*). The second important fossil is the posterior part of a lower jaw found in the Tertiary shales of Porto Rico and described by Matthew in 1916. He referred it provisionally to *Halitherium*, (*H. antillense*) making thus a second genus of fossil sirenian probably common to both European and American seas in Tertiary times. It may be recalled here that the living genus *Trichechus* is also represented in modern times by manatees on both sides of the Atlantic.

This brief review will serve to indicate the paucity of remains of fossil sirenians known from the western side of the Atlantic. The additional bones which form the subject of this paper consist of a humerus (lacking the proximal epiphysis), the axis and fragments of succeeding cervical and other vertebræ, together with numerous pieces of ribs from Mulberry, Florida. All are from the so-called "land-pebble phosphate deposits" (Sellards, 1915). Their unworn condition indicates that they were deposited during the formation of this pebble conglomerate, probably in late Miocene or early Pliocene time, and so are not derivatives from the older upper Oligocene marl from which the conglomerate is formed. The present broken condition of most of the bones seems due

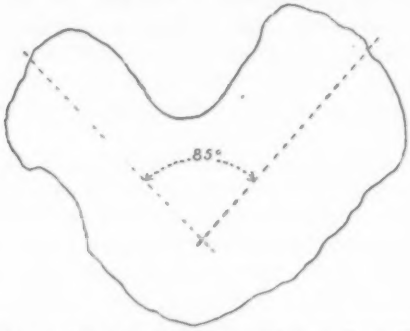
to their rough treatment in the process of mining the phosphate commercially. The axis was loaned by the Florida Geological Survey and the other fragments were presented to the Museum of Comparative Zoölogy through Mr. F. F. Ward of the International Agricultural Corporation, from whose works at Mulberry, Florida, they were secured.

Although no fragment of the skull was recovered, these bones are sufficient to show that the animal is in no way closely related to the manatees but that its relationships are rather with the dugongs in a broad sense. Further, it seems evident that so far as the present material goes, this ancient sirenian was a member of the genus *Metaxytherium*, well represented in the Miocene of Europe. Of the several species recognized by Abel (1904) in his excellent monograph on the Tertiary Sirenia of the Vienna basin, it seems most nearly to resemble *M. cuvieri* of the late Miocene. The slight differences in various details from the recorded European specimens, however, seem sufficient to give it specific distinction.

It was not until after this conclusion had been reached, that the writer received Dr. O. P. Hay's (1922) paper briefly describing as *Metaxytherium floridanum* a broken tooth in place in a fragment of a maxillary, also from Mulberry, and undoubtedly representing the same species if not the same individual. The notes prepared, however, seem worth offering, not only as contributing slightly to a knowledge of the skeleton of this animal, but also as corroborating this first record of the genus from the western side of the Atlantic.

*Humerus.*—The humerus (plate 26, fig. 5) as preserved is 200 mm. in length but the proximal epiphysis is lacking. Its salient characteristics are the large outer and smaller inner epiphysial tuberosities, as indicated by the well preserved surface of contact, the stout, heavy form of the shaft, tapering slightly in side view to the lower end; the broad and rather deep bicipital groove; and the very large deltoid ridge with overhanging projection at its summit. (In the manatees the slender shaft quite lacks the bicipital groove and the deltoid ridge is barely indicated by a slight roughness.) It agrees rather closely with Blainville's figures of the humerus of *M. cuvieri*, but the shaft is perhaps longer in proportion, the deltoid ridge less sharp, and the bicipital groove slightly shallower. Abel (1904) has shown in his monograph that beginning with the middle Eocene sirenian, *Eötheroides ægyptiacum*, an ascending series may be made including *Halitherium schinzi* of the Oligocene, *Metaxytherium krahuletzi*, *M. petersi*, and *M. cuvieri* of early, middle and later Miocene respectively, and culminating with the dugong (*Dugong dugong*) of the

present time, in which there is a gradual development of the outer tuberculum and an enlargement of the angle formed between the axes of the outer and inner tubercles of the humerus. In the first-named genus the inner tubercle is larger than the outer but in later forms the reverse is true. A projection of the proximal end of the humerus of the Floridan species is shown in the figure, and gives some idea of the relative size of the two tubercula where they fuse with the shaft. The angle between their axes is also seen to be approximately 85°, practically the same as in *M. cuvieri*. These same species show also a progressive development of the deltoid ridge, which is slight in *Eötheroides* and




PROJECTION OF HEAD OF HUMERUS, PROXIMAL END, TO SHOW RELATIVE SIZE OF OUTER (RIGHT) AND INNER (LEFT) TUBEROSITIES AND THEIR ANGLE

increases in prominence in the later species. In the Floridan humerus it commences at the inner corner of the distal condyle and rises bluntly as it passes diagonally across to the major tuberosity, just below which it overhangs to the exterior. Along its lower internal border is a roughened area and a shallow oval pit, features present also in that of *M. cuvieri*. On account of their forming an orthogenetic series in this and sundry other characters of the skeleton, Abel would include the four genera just mentioned in the single family Halicoridæ, or as it must apparently be called, Dugongidæ of which *Dugong* and *Hydrodamalis* are the culminating members.

The following are measurements of the Floridan humerus:

| | mm. |
|---|---|
| Greatest length (proximal epiphysis lacking) | 200 |
| Greatest width, fore-and-aft, proximally | 85 |
| Greatest width, transverse, proximally | 87 |

| | |
|---|---|
| Narrowest transverse diameter of shaft | 47 |
| Greatest transverse diameter at distal end | 91 |
| Width of distal condylar surface | 59 |
| Least thickness above distal condyle | 36 |

The humerus of *M. cuvieri* is described as having the shaft much compressed laterally, thus differing from that of *M. krahuletzi*. A specimen from France, lacking the proximal epiphysis, is said to measure 220 mm. in length, 120 in width at the proximal and 105 at the distal end, thus rather stouter than in the Floridan animal. In the latter, about two-thirds of the width at the distal end is taken up by the condylar surface, while the remaining, inner third consists of a prominent roughened expansion for muscle attachment. A cross section of the humerus through the middle of the shaft, would be nearly an isosceles triangle with the base on the external side.

*Vertebræ.*—Of the vertebræ, in addition to eleven centra from the dorsal, lumbar, and caudal regions, I have had for study a nearly perfect axis (plate 26, figs. 1, 2) with parts of four succeeding cervicals cemented to it by the marl of the matrix. This specimen, loaned by the Florida Geological Survey, is also from the phosphate beds, and is confidently referred to the same species as the humerus. The axis is considerably larger than the corresponding vertebra in the modern dugong or manatee, but with a much narrower opening for the spinal cord. As in the dugongs the odontoid process is narrow and much produced forward, in contrast to the condition in the manatee where it is lower and blunter. On its inferior surface is an oval facet for articulation with the atlas. The edges of this facet are sharply outlined except in front where the articular surface merges with the tip of the process. In the modern dugong this facet is likewise oval, but in the manatee it is nearly circular while in both its surface does not become altogether confluent with that of the tip of the odontoid process.

The two lateral articular surfaces in the Floridan specimen are roughly circular rather than kidney shaped as in the recent *Dugong*, and they have the additional peculiarity that at the lower anterior corner of each is a narrow tongue-like extension of the articulating facet, a condition apparently hinted at in the Steller's sea-cow (*Hydrodamalis*). The ascending arms of the neural arch are convergent and nearly straight, expanding at the summit to a broad, flattened top that hooks forward somewhat as in the latter genus and in the dugong. Capellini (1886) figures a similar condition in *Metaxytherium lovisati*. In the manatee the condition is much simpler, the ascending arms of

the arch converging to a blunt point without the overhang anteriorly, and there is also in some specimens a nearly complete vertebrarterial canal on the axis, the upper arm of which is the better developed. In the dugong this canal is widely open with its lower projection nearly obsolete. In the Floridan fossil the condition was similar, with the lower part represented by a mere projection, while the upper portion though broken off, was apparently very small, practically as in *M. lovisati*.

The neural arches of the three succeeding vertebræ are very much compressed but apparently all these cervicals remained distinct. Their summits bowed slightly forward and the anteriormost fitted into a depression at the back of the expanded top of the axis.

The following measurements are of this specimen (6165 Fla. Geol. Surv.).

| | mm. |
|---|---|
| Greatest vertical height of axis | 108 |
| Greatest transverse width across articular facets | 93 |
| Greatest transverse width at summit | 45 |
| Height of neural canal | 38 |
| Width of same at base | 29 |
| Greatest length from tip of odontoid process to posterior edge of centrum | 60 |
| Approximate length of odontoid process from a line joining front edges of lateral facets | 28 |
| Length of ventral facet on odontoid process | 33 |
| Third cervical, antero-posterior diameter of centrum | 17 |

The remaining vertebræ at hand are all much injured through rough handling in the process of extraction, and consist of little more than centra. The most interesting point about them is the condition of their epiphyses. In the more ancient forms of sirenians, such as *Halitherium* of the Oligocene, the vertebral epiphyses are thin and wafer-like, though complete and well ossified. In the later genus *Metaxytherium* of the Miocene in Europe, as shown by Abel (1904, p. 91), these epiphyses are in a very characteristic stage of reduction. They have become thinner and in consequence the central part of the bony plate presents an eroded appearance, pitted with small irregular grooves and depressions, while the peripheral portion remains more solid though exhibiting indistinct concentric lines in a definite border. In the manatee a further stage is exemplified in the reduction of the epiphysis to a narrow and incomplete ring, formed by fragments of this peripheral area, while in the living dugong even this has disappeared so that there are no epiphyses to the vertebræ. The condition in *Felsinotherium* is not

wholly clear, though to judge from Capellini's (1872) figures, there is a thin epiphysis to the vertebræ of this Pliocene genus of Europe.

The vertebræ (plate 26, figs. 3, 6) of the Floridan animal agree with those of the European *Metaxytherium* in the partial degeneration of their epiphyses. Several specimens show them as thin plates nearly covering the face of the centrum, but with the characteristic worm-eaten appearance of the middle portion surrounded by a more solid border marked with concentric lines. This agreement, together with the similarity in shape of the humerus, seem sufficient to justify associating them with *Metaxytherium*.

Among the eleven centra preserved are some with demi-facets for the capitulum of the rib at anterior and posterior borders, as well as others from farther back, having a single facet only, in the middle of the upper part. Others represent lumbar and caudal vertebræ, the latter with facets for the articulation of the chevron bones. The following measurements indicate the large size of these centra. The diameters are for the surface of articulation at the larger end of each.

| | LENGTH | VERTICAL DIAMETER | TRANSVERSE DIAMETER |
|---|---|---|---|
| | mm. | mm. | mm. |
| 1. Anterior dorsal, with two demifacets | 61 | 65 | 100 |
| 2. Anterior dorsal, with two demifacets | 63 | 59 | 98 |
| 3. Anterior dorsal, with anterior demifacets | 75 | 85 | 104 |
| 4. Posterior dorsal, with median articular facet | 61 | 62 | 100 |
| 5. Posterior dorsal, with median articular facet | 55 | 67 | 103 |
| 6. Lumbar | 63 | 67 | 108 |
| 7. Anterior caudal | 65 | 73 | 101 |
| 8. Caudal | 55 | 57 | 85 |

*Ribs.*—Of the numerous rib fragments of this animal, several pieces are large enough to show that the ribs were less specialized than those of the manatee, in which the central portion is greatly expanded and then tapers to a pointed distal end. The ribs (plate 26, figs. 4, 7) of the Floridan fossil, however, though thick and heavy, were much like those of the Steller's sea-cow, and but slightly smaller, maintaining their transverse diameter very evenly for the greater part of their length and narrowing a little distally. One portion, over 200 mm. long, is 50 mm. in width at each end. The transverse diameter at one end is 28 and at the other 30 mm. It is apparently from the upper half of a rib. The most massive fragment, some 320 mm. long is 62 mm. wide and 47 thick

at the larger end and tapers with a slight curve to a width of 54 and a thickness of 38 mm.

SUMMARY

The humerus and vertebræ of a large extinct sirenian from the land-pebble phosphate deposits of Florida seem best to agree with those of the genus *Metaxytherium*, hitherto known from Miocene strata of the Mediterranean basin, and undoubtedly represent the species *M. floridanum* Hay (1922). It makes a third genus of fossil sirenian to be reported more or less definitely from both sides of the Atlantic. From the same deposits have been reported two genera of long-beaked dolphins, representatives of which occur also in the Miocene of Europe. The age of the Florida *Metaxytherium* may be late Miocene or early Pliocene. The occurrence of at least three families of sirenians (Prorastomidæ, Dugongidæ, and Trichechidæ) in former to Recent times indicates that the western Atlantic has been more favored by representatives of this order than has been generally supposed. Nor can it be doubted that members of the dugong and the manatee families were coëxistent on our southern coasts in the late Tertiary. For, as emphasized by Abel, the manatees must have branched off very early from the ancestral stock and formed a line collateral to that of the dugongs.

LITERATURE

Abel, Othenio. 1904. Die Sirenen der mediterranen Tertiärbildungen Österreichs. < Abhandl. K. K. Geol. Reichsanstalt, Wien, vol. 19, pt. 2, p. i–vi, 1–223, 7 pls.

Capellini, Giovanni. 1872. Sul felsinoterio, sirenoide halicoreforme dei depositi littorali pliocenici dell'antico bacino del Mediterraneo e del Mar Nero. < Mem. Reale Accad. Sci. Ist. Bologna, ser. 3, vol. 1, p. 605–654, 7 pls.

1886. Sopra resti di un sirenio fossile (*Metaxytherium lovisati*, Cap.) raccolti a Monte Fiocca presso Sassari in Sardegna. < Mem. Reale Accad. Sci. Ist. Bologna, ser. 4, vol 7, (17 pp.) 1 pl.

Case, E. C. 1904. Systematic paleontology of the Miocene deposits of Maryland. Mammalia. < Maryland Geol. Surv., Miocene, p. 3–58, pl. 10–26, fig. 1.

Cope, E. D. 1869. Synopsis of the extinct Mammalia of the cave formations in the United States, with observations on some Myriapoda found in and near the same, and on some extinct mammals of the caves of Anguilla, W. I., and of other localities. <Proc. Amer. Phil. Soc., vol. 11, p. 171–192, pl. 3–5.

1883. On a new extinct genus of Sirenia from South Carolina. <Proc. Acad. Nat. Sci. Phila., 1883, p. 52–54.

1890. The extinct Sirenia. < Amer. Nat., vol. 24, p. 697–702, pl. 25–26.

METAXYTHERIUM FLORIDANUM HAY

(Allen: Fossil Dugong of Florida.)

DeKay, James. 1842. Zoology of New-York, or the New-York fauna; [etc.] Part I. Mammalia. 4to, Albany, vol. 1, pp. xv, 146, 33 pls.

Hay, O. P. 1919. Descriptions of some mammalian and fish remains from Florida of probably Pleistocene age. < Proc. U. S. Nat. Mus., vol. 56, p. 103–112, pl. 26–28.

1922. Description of a new fossil sea cow from Florida, *Metaxytherium floridanum*. <Proc. U. S. Nat. Mus., vol. 61, p. 1–4, pl. 1.

Leidy, Joseph. 1856. Notice of some remains of extinct vertebrated animals. < Proc. Acad. Nat. Sci. Phila., vol. 8, p. 163–165.

1869. The extinct mammalian fauna of Dakota and Nebraska, including an account of some allied forms from other localities, together with a synopsis of the mammalian remains of North America. < Journ. Acad. Nat. Sci. Phila., ser. 2, vol. 7, p. 1–472, pl. 1–30.

1873. Contributions to the extinct vertebrate fauna of the western Territories. Rept. U. S. Geol. Surv. Terr., vol. 1, p. 5–358, pl. 1–37.

Lydekker, Richard. 1887. Catalogue of the fossil Mammalia in the British Museum, (Natural History). Part V. 8vo, London, pp. xxxv, 345, 55 text-figs.

Matthew, W. D. 1916. New sirenian from the Tertiary of Porto Rico, West Indies. <Ann. N. Y. Acad. Sci., vol. 27, p. 23–29, 2 text-figs.

Owen, Richard. 1855. On the fossil skull of a mammal (*Prorastomus sirenoïdes*, Owen), from the island of Jamaica. < Quart. Journ. Geol. Soc. London, vol. 11, p. 541–543, pl. 15.

Palmer, William. 1917. The fossil seacow of Maryland. < Science, new ser., vol. 45, p. 344.

Sellards, E. H. 1915. The pebble phosphates of Florida. < 7th Ann. Rept. Florida State Geol. Surv., p. 25–116, fig. 1–52.

## EXPLANATION OF PLATE 26

*Metaxytherium floridanum* Hay.

Fig. 1. Axis and three succeeding vertebræ in side view; Florida Geol. Surv. 6165. × 0.5.

Fig. 2. The same from in front. × 0.5.

Fig. 3. Centrum of a caudal vertebra showing the characteristic appearance of the epiphysis with its pitted central area. Facets for articulation of chevron bones appear at the lower side. Mus. Comp. Zoöl. × 0.5+.

Fig. 4. Head of a rib. Mus. Comp. Zoöl. × 0.32.

Fig. 5. Humerus, lacking proximal epiphysis, anterior view. Mus. Comp. Zoöl. 15752. ×0.5.

Fig. 6. Centrum of a dorsal vertebra, showing characteristic epiphysis, though much broken. Mus. Comp. Zoöl. ×0.5+.

Fig. 7. Large rib fragment, viewed in an antero-posterior direction. Mus. Comp. Zoöl. × 0.32.

*Cambridge, Mass.*

# OBSERVATIONS ON THE MIOCENE SPECIES URSUS PRIMAEVUS GAILLARD

By James W. Gidley

[*Plate 27*]

By reason of a recent much appreciated gift from Dr. Claude Gaillard, director of the Natural History Museum of Lyons, France, there is in the United States National Museum collection, a fine cast of the type of *Ursus primaevus* Gaillard. This cast, for lack of access to the actual type, forms the basis of the present communication.

The type of this species was found in the fossil-bearing beds of Grive-Saint-Alban, reported by Gaillard as of Middle Miocene age, and is now in the Museum of Lyons. With the piece of maxillary were associated a lower carnassial and some isolated teeth considered of the same species.

Gaillard[1] gave an excellent description of this specimen making it the type of a new species of the genus *Ursus*. It being a Miocene form and, thinking to observe certain primitive characters in the teeth, Gaillard was led to consider it as ancestral to the genus *Ursus* and also as apparently connecting the living ursids with the ancient canids. A restudy of this species, by means of the excellent cast in hand, has led me to quite different conclusions from those of Gaillard. regarding its taxonomic position.

Gaillard compared *U. primaevus* with the principal types, both fossil and living, of the Ursidæ and Canidæ, giving a table of measurements of the corresponding teeth of the upper cheek-tooth series $p^4$ to $m^2$, and it seems to be chiefly on the relative proportions and modifications especially of the upper carnassial that Gaillard has based his belief that this species appears to connect the living bears with the ancient dogs, as well as his statement that *U. primaevus* appears to constitute an ancestral form, "the most direct and the most ancient," of the genus *Ursus*.

Gaillard described this tooth as being relatively large, long and trenchant, and states that the inner denticle is placed facing the large antero-external cusp (= paracone of Osborn's molar nomenclature) instead of being brought back to the posterior external cusp (= metacone) as in the living bears. These differences, however, are apparently not so important as Gaillard seemed to consider them especially if comparison is made with the living genera *Helarctos* and *Melursus*. In fact it would seem it is with these two genera that *U. primaevus* should more

[1] Compt. Rend. Acad. des Sci., vol. 127, 1898, pp. 1237 to 1239.

especially be compared. In such comparison most of the intermediate characters considered as connecting the bears with the dogs disappear.

True, the upper carnassial is trenchant, but is only slightly more so than in *Helarctos*, while the internal tubercle is placed but little, if any, forward of the position of this cusp in that genus when present and in *Melursus*. Comparing these forms, as represented in pl. 27, figs. 4 and 5, it will be seen that were the internal cusp of $p^4$ enlarged in *Helarctos malayanus* and if the more blade-like metaconid in *U. primaevus* were slightly shortened, the upper carnassials of these two species would be structurally almost identical. The essentially important feature in this connection is the fact that the protocone of $p^4$ in *U. primaevus* is not situated directly opposite the large paracone but is placed slightly though definitely behind the center of the base of this cusp, as in *Helarctos* and *Melursus*, and thus is definitely ursid in character as compared with the canids and in fact all other carnivores in which this cusp is present. In all carnivores except the bears the inner cusp of $p^4$ when present is always situated forward of the middle of the base of the paracone. Heude has recognized this fact[2] and on account of it and the anterior position of $p^4$ in the bears, which is situated anterior to the infraorbital foramen, has expressed a doubt that the bears should be included in the order Carnivora.

The scope of this paper does not lend itself to a full discussion of this interesting question. It may be stated, however, that there is more importance to be attached to the relative position of the inner cusp of $p^4$ in the carnivores than may at first appear. It is of especial significance that this difference in position is accompanied by a different functioning of the inner cusp of $p^4$ with the lower carnassial; namely, that in all adult carnivores except the bears, in which a single inner cusp is present in the upper carnassial, this cusp meshes, or bites, in front of the anterior cusp (= paraconid) of the lower carnassial and between it and the main cusp of lower $p_4$. In all the bears the inner cusp when present falls behind the paraconid, biting into the basin of the trigonid.

In most adult Procyonidæ the upper carnassial has two inner cusps, but in proportion as this tooth is observed to be sectorial in function the anterior cusp seems to become more important, while the posterior one diminishes and tends to disappear as in *Nasua*. Of importance in this connection also is the fact that when both inner cusps are present (*Procyon*) the anterior one functions as in the true carnivore as described above, and the posterior one as in the bears. This lends support to the

[2] Mém. Hist. Nat. Emp. Chinois, vol. 5, pt. 1, 1901, p. 2.

ground assumed, by Heude, that in the bears it is the posterior inner cusp only which has been developed while in all other carnivores it is the anterior cusp which appears in the adult sectorial carnassial. In further support of this hypothesis it may be noted also that in modified form, the deciduous carnassials, apparently of all carnivores, are substantially as in the adult bears, suggesting that this condition in the bears is primitive and is inherited from an ancestry which preceded the development of a true sectorial carnassial.

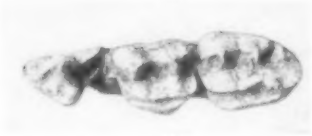
That the main inner cusp of the deciduous carnassial in the canids is not homologous with that of the corresponding adult tooth is clearly shown in a specimen of a young fox in the National Museum collection (Cat. No. 25424 Div. Mammals). In this specimen $dp^4$ has a main inner cusp, supported by a fang, situated just posterior to the middle of the base of the anterior outer cusp or paracone, in just about the position of this cusp in $p^4$ of *U. primaevus*, *Helarctos* and *Melursus*, and functions with the lower carnassial as in the bears. Anterior to this is another smaller cusp situated close to the parastyle. This cusp rather than the larger and more posterior one seems to represent the inner cusp of the adult replacement tooth as it corresponds exactly in relative position with the single inner cusp of the adult carnassial of this species.

In further comparing the upper cheek-teeth of *U. primaevus* with those of *Helarctos* (see pl. 27, figs. 4 and 5) it will be noted that the resemblances especially in the molars are most marked, not only in general characters of form and proportions, but in detail. The carnassial in the living genus although relatively smaller holds still its subtrenchant form, although the posterior blade (metacone) is shortened and the anterior cusp (paracone) is slightly shortened and somewhat more depressed. The carnassial of *Melursus* (see pl. 27, fig. 3) in respect to the inner cusp is even more like that of *U. primaevus*. In this genus the inner cusp is somewhat larger but is placed almost exactly as in the Miocene species, that is slightly behind the midline of the base of the anterior external cusp. The upper carnassial of either *Helarctos* or *Melursus* is directly derivable from exactly such a form as that presented in *U. primaevus*. This and the close correspondence both in general form and in detail of the true upper molars of *U. primaevus* with those of *Helarctos*, leave little doubt of a real relationship of these two forms; these teeth in the living genus being slightly more progressive in that they are a little more elongate and have the cingula, both exterior and interior, somewhat less well defined. In *Melursus* the upper molars are of about the same relative length to each other as in *Helarctos* and *U. primaevus*, but the

1.

2.

3.



4.

5.

6.

A Comparative Series of Upper Cheek Teeth of the Left Side, Comprising $p^1$ to $m^2$

Fig. 1. *Canis lupus signatus*. Recent. Fig. 2. *Amphicyon major*. Middle Miocene. (From Woodward after Gaudry) $\times \frac{3}{5}$. Fig. 3. *Melursus labiatus*. Recent. Fig. 4. *Ursus primaevus* Gaillard. Middle Miocene. (Cast.) Fig. 5. *Helarctos malayanus*. Recent. Fig. 6. *Ursus arctos*. Recent. All figures, except Figure 2, about natural size.

$m^2$ in *Melursus* is relatively narrower and the cingula of both upper molars, so conspicuous in the other two forms just mentioned, are almost non-existent in *Melursus*.

From this restudy I conclude that *U. primaevus* of Gaillard is a true ursid which cannot be considered a connecting link between the ursids and canids any more than can the living genera *Melursus* and *Helarctos* be so considered. Moreover the middle Miocene species, *U. primaevus*, in view of its very close resemblance to *Helarctos malayanus*, seems already to have acquired too exactly the characteristics of the sun-bear group to be considered an ancestor of the living genus *Ursus*, and in my opinion much more probably represents a very closely related form if not an actual ancestor of the living *Helarctos*. *Melursus* also may have been derived from this or a closely related form. But in the latter supposition it must be assumed, as seems quite possible, that the carnassial in *Melursus* has retained more nearly its ancestral condition of the sectorial, only having the cutting blade somewhat shortened and the mass of the internal tubercle slightly enlarged, while the molars have reached a more advanced degree of simplified specialization which was directed toward a more bunodont condition of the principal cusps together with a progressive loss of the encircling cingula. However, aside from other considerations the Miocene species seems to carry within itself sufficient characteristic features to place it in a distinct genus. This fact was recognized by Max Schlosser who in 1899[1] referred Gaillard's species to his genus *Ursavus* which was based primarily on *Cephalogale brevirhina* Hofmann. Schlosser also recognized the close resemblance of these fossil species to *Helarctos*. The more important characters presented in *U. primaevus* which mark it as generically distinct from any of the living bears may be stated as follows:

Carnassials relatively larger and more definitely trenchant than in any of the living genera of bears, with the inner cusp of this tooth placed just behind the base of the paracone, about as in *Melursus* and as in *Helarctos* when present in the latter. Upper molars essentially like those of *Helaractos;* that is, not greatly unequal in size, with the outer main cusps (paracones and metacones) distinctly tuberculate and definitely ridged on their fore and aft borders, while the main inner cusps (protocones and hypocones) are almost obliterated in a relatively low and continuous antero-posteriorly directed ridge.

*U. S. National Museum, Washington, D. C.*

[1] Palæontographica, vol. 46, p. 104. 1899.

# THE MAMMALS OF WELLINGTON AND WATERLOO COUNTIES, ONTARIO

By J. Dewey Soper

The forty-two species of mammals incorporated in the following list are all those, both indigenous and exotic, known to inhabit, or recently to have inhabited, Wellington and Waterloo Counties, Ontario. One or two hypothetical species have been included for the reason that their known ranges so obviously inclose the area under review that it is only a matter of time until specimens will come to hand to support their inclusion in the present paper. The list, as a whole, is founded principally on personal observations and studies commenced about the year 1909. From then until 1921 my residence here and there within the two counties was unbroken save for a three years' absence from 1912 to 1915.

Wellington and Waterloo Counties adjoin, the latter lying to the southwest. Their combined area, marked by a very irregular boundary, approximates 1900 square miles, occupying roughly the position between latitudes 43° 15′ and 44° north and longitudes 80° and 81° west. Guelph, the capital of Wellington county, situated in the southern part of the region, is about 50 miles west of Toronto.

The two counties lie entirely within the Transition life-zone, though there is evidence of a slight infusion of the overlying Canadian element along the extreme northern end of Wellington. Throughout the region, and even much farther south, occur "boreal islands" of varying size, closely simulating the Canadian with the characteristic hummocky ground leaning to the muskeg type, with its growth of spruce, sphagnum moss, blueberry and Labrador tea. A few of the characteristic trees of the region are: hard and swamp maple, white and bur oak, white and black ash, basswood, white pine, tamarack, white spruce, hemlock, balsam fir, white cedar, trembling and large-toothed aspen, yellow birch, ironwood, beech, red and white elm. The average altitude of the region is about 1000 feet above the sea, with the maximum of 1378 feet at Mount Forest in the north and the minimum of 925 at Preston in the south.

The country is gently rolling in character, with good soil, and with innumerable streams, of which the Grand, Conestoga, and Upper and Lower Speed Rivers are the most notable. Feeders to these are the multitude of small, sparkling spring-runs so typical of eastern North America. Lakes of any description are almost entirely wanting, the one exception being the fair-sized Lake Puslinch in southern Wellington.

The whole country has been heavily glaciated and bears the characteristic topography of such regions in the occurrence of vast deposits of glacial till, erratic boulders, terminal moraines, and gravelly eskers.

I cannot pass without mentioning the cordial assistance which I received throughout many years in my mammal studies from Mr. W. E. Saunders, London, Ontario; Dr. R. M. Anderson, Ottawa; Mr. C. W. Nash, and Mr. J. H. Fleming, Toronto; Mr. Ernest T. Seton, Greenwich, Connecticut; and the United States Biological Survey, Washington, D. C., to all of whom at this time I wish to tender my grateful acknowledgments.

1. **Odocoileus virginianus borealis** Miller. Northern Virginia Deer.—Probably exterminated in the southern portion of the counties about 1865. "At Mount Forest almost exterminated some years ago, but now (1897) increasing in numbers. All killed off at Milton many years ago" (Brooks).[1] In 1905 Brooks[2] refers to the species as "occasional near Mount Forest."

2. **Sylvilagus floridanus mearnsii** (Allen). Prairie Cottontail.—Commonly distributed throughout the region. This animal is not a native species, having entered Ontario with the clearing of the land sometime around 1870. Nash[3] first saw it along the Niagara River during the winter of 1871–72, while it was first recorded at Toronto, according to Fleming,[4] thirteen years later. Brooks, quoted by Miller in 1897, says that the cottontail was common at Guelph and that it had recently extended its range north nearly to Mount Forest. Today it is relatively plentiful in suitable localities throughout both counties and widely hunted in season. So prolific is the species that in forty years time it has invaded the whole of the southern peninsula of Ontario and entrenched itself with all the security of an indigenous race. Unlike the native snowshoe rabbit, the cottontail resorts to burrows during the breeding season and at other times. Two or three broods of young are produced in a season, often in open grassy nests on the surface of the ground among rank vegetation. The litter contains from four to six. One that I found in a strawberry patch about July 10, 1908, contained three.

3. **Lepus americanus virginianus** Harlan. Southern Varying Hare.—Formerly much more common than at present. A number still survive in the more remote and secluded swamps where they have been gradually forced through the clearing of the land. The relative abundance of the two rabbits, as compared with that of forty years ago, is exactly reversed, the cottontail being now the common kind. In the southern part of the counties the fall shedding for the white winter coat commences about November 10, and the spring turn about March 20.

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[1] Miller, G. S., Jr., Mammals of Ontario. Proc. Boston Soc. Nat. Hist., vol. 28, no. 1, 1897.

[2] Brooks, Allan, The Mammalia of Northern Wellington, Ontario. Ontario Nat. Sci. Bull., no. 1, 1905.

[3] Nash, C. W., Vertebrates of Ontario, p. 84, 1908.

[4] Fleming, J. H., Mammals of Toronto, Ont., reprint, "Nat. Hist. Toronto Region." 1913.

4. **Lepus europæus** Pallas. European Hare.—This exotic species has been reported from several localities in the two counties, but especially from the Guelph region and the southwest portion of Waterloo County. From an article by J. R. Dymond in the Canadian Field Naturalist, vol. 36, no. 8, it is learned that this species was introduced into Ontario at Brantford by Otto Herold in 1912. From all reports the species is spreading quite rapidly over the country.

5. **Erethizon dorsatum** (Linn.). Porcupine.—Probably occurs rarely in the more remote districts. I have never met with the animal in the area here considered, though I have heard several vague rumors of its having been seen.

6. **Zapus hudsonius hudsonius** (Zimmermann). Jumping Mouse.—This beautiful species is very generally distributed but is nowhere common. It usually frequents the open fields during harvest time and certain local areas seem for the time well populated. I have come upon jumping mice in grain fields in early August when they appeared to be associating in little bands, perhaps families. The young observed at this time are about two-thirds grown.

7. **Evotomys gapperi gapperi** (Vigors). Red-backed Vole.—This vole was described by Gapper from Toronto in 1830. Fleming says in his "Mammals of Toronto," 1913, that there are no recent records for the region and I know of none whatever for that latitude in Ontario aside from the record made by Gapper so long ago. I have, myself, never succeeded in taking it in either Wellington or Waterloo counties, though I have diligently trapped many likely localities. There are numerous boreal "islands" or swamps, as mentioned in the introduction, even in the southern parts of the counties, which seem ideal for this animal, but long lines of small mammal traps failed to secure any. It is an animal essentially of northern regions, occurring in some of its races from the lower edge of the Canadian faunal zone entirely to the Arctic. Brooks, according to Miller, found it "common under mossy logs in thick evergreen woods and along creek bottoms at Mount Forest." Many localities in northern Wellington are undoubtedly Canadian in every respect, yet in August, 1920, when Mr. W. E. Saunders and I went into Proton, a short distance north of Wellington in search of the rare woodland jumping mouse, *Zapus insignis*, we captured but one red-backed vole out of forty traps in three nights. The swamps were typically northern and the altitude 2000 feet. Perhaps another year one would find *Evotomys* common. Many animals have peculiar cycles of abundance.

8. **Microtus pennsylvanicus pennsylvanicus** (Ord). Meadow Vole.—Occurs abundantly throughout the region. Some years it is more abundant than others, but it is always the most common and destructive of small rodents in the area discussed.

9. **Synaptomys fatuus** Bangs. Lemming-vole.—Brooks does not mention this species for Wellington, nor have I ever succeeded in taking it within the region. It is my conviction, however, that the animal *does* occur and that sooner or later it will unquestionably be captured. I have repeatedly trapped over different boreal "islands" occurring in the region, but with negative results, as already stated, and this, too, with this animal expressly in view. The species, however, is generally very local in distribution and where eventually discovered may be common enough. The region is comfortably within the range of the animal, as Saunders has taken it near London in a district where the fauna is very northern.

10. **Fiber zibethicus zibethicus** (Linn.). Muskrat.—Because of the lack of extensive lakes and marshes in Wellington and Waterloo Counties, this animal has never, I think, been very common. Still, numbers are yet met with locally in favorable places, small marshes, sedgy borders of the larger streams, and in the sluggish smaller ones. They build both the lodge and bank nests. Miller says that Brooks found it common at Mount Forest, 1897.

11. **Peromyscus leucopus noveboracensis** (Fischer). Fischer's White-footed Mouse.—A common species, ranging over the open fields and thinner woodland, and occurring over the entire region. Brooks reported the species to Miller in 1897 as being abundant at Mount Forest.

12. **Peromyscus maniculatus gracilis** (LeConte). Canadian White-footed Mouse.—There are no previous authentic data to indicate that this form occurs throughout the two counties. The ranges of *noveboracensis* and *gracilis* are known to overlap, the first keeping principally to the more open, dry situations and the latter to the seclusion of woods and swamps. I have before me a large series of *Peromyscus* from southern Waterloo and it is easily divisible at a glance into two distinct series regardless of sex, age, or date of capture. The one series is much longer tailed on the average and duskier than typical *noveboracensis* and unquestionably represents *gracilis*. The specimens appear to answer fully to Osgood's[5] description and may confidently be referred to the present form. They are distinctly intermediate in duskiness of pelage between *noveboracensis* and specimens of *P. m. maniculatus* (= *umbrinus*) from Ridout and Temagami, northern Ontario, though nearer the latter. They are not as dark as a specimen of *gracilis* (= *canadensis*) from Saunders's collection taken at Cache Lake, Algonquin Park, Ontario, obviously from the very center of *gracilis* territory. This specimen, however, is evidently a juvenile, being strongly suffused with the plumbeous-grey common to the young of mice of this genus. Brooks found the race at Mount Forest in damp evergreen woods and along creek bottoms, a characteristic habitat. Saunders records the southernmost point of capture in Ontario as the southeast corner of Lake Huron where he took specimens in 1907 and 1908.

13. **Peromyscus maniculatus bairdii** (Hoy and Kennicott). Baird's White-footed Mouse.—This species, like the cottontail rabbit, has invaded the country from the south as cultivation progressed. The first Ontario record was established by W. E. Saunders at Point Pelee in 1907. It is very common there now, inhabiting the open beaches and the adjacent juniper thickets. It is known locally as the beach mouse and sometimes appropriately called the prairie deer-mouse, for it is essentially an animal of the open. When I was at Point Pelee with Mr. Saunders in March, 1919, I found the animal quite numerous, though Mr. Saunders assured me that the deep snow of the previous winter had very appreciably reduced its numbers. In 1909 Mr. Saunders writes:[6] "Further investigation has shown that it (*P.m. bairdii*) is abundant on parts of the mainland nearby and occurs in moderate numbers throughout the western counties and as far north as the south-east corner of Lake Huron." In the Ottawa Naturalist for January,

[5] Osgood, W. H., Revision of the mice of the American genus Peromyscus, North Amer. Fauna, no. 28, p. 42, 1909.

[6] Saunders, W. E., Ontario Nat. Sci. Bull., no. 3, 1909.

1913, Mr. Saunders records a specimen which he trapped on December 12 at his home in London and points out that there is every reason to believe that the species is gradually extending its range into Canada eastwards and northwards. This supposition was later completely borne out by my findings in Waterloo County near Preston. On July 22, 1916, I caught the first specimen of *bairdii* reported for Waterloo, establishing the northernmost record at that time. It was identified by Dr. R. M. Anderson of Ottawa. It was a female measuring: Length, 147; tail, 59; hind foot, 19, and is now in the collection of Ernest Thompson Seton. It matches the series of *bairdii* from Point Pelee. This species is easily distinguished from other forms of *Peromyscus* inhabiting Ontario, being decidedly smaller and more dusky. On August 5, 1919, near Preston, I captured two more in the center of a large grain field. This was a good illustration of the persistent northeastward trend of this prairie-loving animal.

14. **Mus musculus** (Linn.). House Mouse.—This is an introduced species and a common nuisance everywhere. Even as early as 1830, Gapper records it as very common at Toronto.

15. **Rattus norvegicus** (Erxleben). Norway Rat.—Nash says: "This destructive creature was introduced into America from Europe about 1775 and has since spread to all parts where white men have settled."[7] It is found throughout Wellington and Waterloo Counties.

16. **Castor canadensis** Kuhl. Canadian Beaver.—The beavers have long ago been exterminated. In the old days they were undoubtedly numerous, as the country with its multitude of small streams and superb woods was an ideal beaver region. There is plenty of evidence of their former occupation in the numerous "beaver-meadows," and the barely traceable old dams which may still be detected along the streams. I know of one very distinct old dam along a small stream in Waterloo County which runs through the woods for upwards of a hundred feet like a miniature esker and has hemlocks and balsams growing on and around it which must be fully sixty years old. The beaver was probably exterminated here about 1865.

17. **Marmota monax monax** (Linn.). Woodchuck.—Common throughout the region and numerous enough in some localities to be a menace to agriculture. It hibernates in the early fall between September 15 and October 1, and appears again about the last week of March. Woodchucks are most extraordinarily early hibernators but they make their appearance again in the spring often under very trying conditions. I have known them to dig out through several feet of snow on a side hill early in March and then to wander widely about on the snow leaving tracks like miniature bear tracks. They are now as alert as they were phlegmatic during the mellow days of autumn. They travel restlessly far and near exploring old dens and sinking shafts down through the snow with marvelous accuracy to some haunt of former years. One individual which I once trailed in early March had located through the snow and reopened at least a dozen holes within a radius of two hundred yards along a wooded ridge. Some litters of young are probably born as early as late March or early April for I have seen juveniles at burrow entrances by May 25.

18. **Tamias striatus lysteri** (Richardson). Northeastern Chipmunk.—This beautiful and entertaining quadruped is found in all suitable localities throughout

[7] Nash, C. W., Vertebrates of Ontario, p. 107, 1908.

the two counties. The type of the race came from Penetang on Georgian Bay. A few specimens tending toward *griseus* have been taken by Saunders in the sand-hill region of Port Franks, southeast corner of Lake Huron. All my specimens for Waterloo and Wellington are typical *lysteri*. In this region the chipmunk hibernates early in November and appears again some time from March 12 to April 1, according to season.

19. **Sciurus carolinensis leucotis** Gapper. Northern Gray Squirrel.—My father tells me that these large squirrels were very plentiful in southern Wellington County about 1875–80, the black phase predominating over the grey about five to one. After that date they began gradually to dwindle in numbers until about 1900–1905, or after, when they became very scarce. In 1910 they began to rally again and have since become tolerably common in some localities. According to my observations they are more numerous in the oak woods southwest of Preston and Galt than in any other place in the two counties.

20. **Sciurus hudsonicus loquax** Bangs. Red Squirrel.—This is a very common species wherever suitable conditions of woodland occur. In spite of the steady advance of cultivation it seems fully capable of holding its own.

21. **Glaucomys sabrinus** (Shaw). Northern Flying-squirrel.—These nocturnal animals are very seldom seen though often comparatively common where they are not known to the residents. The gradual and inevitable clearing of the woods of southern Ontario is sadly depleting their range and therefore reducing their numbers. Fifteen years ago they were still commonly met with in the cedar swamps of southern Wellington and are likely uniformly distributed yet in appropriate districts. When a boy on the farm in that region, I secured many in harmless box-traps and kept them as pets in spacious cages both winter and summer. They are sweet-tempered, docile little creatures and bear repeated handling without sign of resentment. They thrive on sweet apples all winter long and seem to require nothing else to keep in condition. On several occasions I have seen them driven with unintentional rudeness from their winter nests in hollow trees by the axes of woodchoppers in Eramosa, but only once have I ever observed the animal in voluntary action during the day.

I have included all of the flying squirrels of the region under *sabrinus*, as I have no positive evidence that the Virginia flying squirrel *volans* occurs, though there is every reason for suspecting its occurrence in the southern parts. This belief is simply founded on the fact that the theoretical range of *volans* covers the present region at least as far north as Fergus, if not the whole area. Brooks mentions only *sabrinus* from Mount Forest. Saunders writes:[8] "This appears to be the common species (*sabrinus*) at Woodstock, while it is entirely absent at London, where *volans* is common. It is probable that *volans* ranges one or two hundred miles farther north." Fleming records only *volans* from Toronto, in a latitude that fairly cuts the middle of Wellington.

A specimen which I have in my collection taken near Fergus on December 16, 1911, is unquestionably *sabrinus*.

22. **Blarina brevicauda** (Say). Eastern Short-tailed Shrew.—A very common species, perhaps outnumbering as a whole all other resident mammals with the exception, possibly, of *Peromyscus* or *Microtus* during the latter's years of abun-

[8] Saunders, W. E., Ontario Nat. Sci. Bull., no. 3, 1909.

dance. It is an animal of very wide choice of habitat, ranging from the driest of brushy uplands through varying conditions of deciduous woodland down to the low-lying swamps.

23. **Sorex personatus personatus** Geoffroy. Masked Shrew.—The masked or Cooper's shrew cannot be called common. In some localities it is difficult to find, although in occasional restricted areas I have had good success in trapping it. It is largely subterranean in habit and is seldom seen. According to my experience it prefers low, moist woodland to dryer situations and I think will be found more commonly as one goes northwards. In one small piece of swamp in southern Waterloo I succeeded in taking about a dozen specimens although I failed to trap a single one over a large surrounding territory.

24. **Sorex fumeus** Miller. Smoky Shrew.—This is a comparatively rare animal in Wellington and Waterloo Counties. Its faunal distribution is the Canadian and upper Transition zones. Neither Gapper nor Fleming mentions it for the Toronto region. Saunders remarks that it "appears to be exceedingly rare in southern Ontario." Brooks writes: "Scarce at Mount Forest; met with in wet evergreen woods only. Not found at Milton." Personally, I have taken it but twice in the region now considered, both times in Waterloo a few miles north of Preston. The first was trapped on March 17, 1917, in a thick wood of pine, hemlock, and beech timber, on well drained ground. It is now in the collection of Ernest T. Seton. The second specimen was taken on April 17, 1917, in a wet, dense cedar swamp. This specimen is in the Provincial Museum, Toronto.

25. **Parascalops breweri** (Bachman). Brewer's Mole.—A very rare species. The only record for the region is that by Alex. Goldie,[9] who captured a specimen in woods near Guelph on March 12, 1907. Mr. Saunders has recently informed me that several have been taken in the London region.

26. **Condylura cristata** (Linn.). Star-nosed Mole.—Uniformly distributed, though uncommon. I have records of occurrence from several widely separated localities and of a specimen taken a few miles north of Hespeler. Brooks says it is "tolerably common at Mount Forest."

27. **Eptesicus fuscus** (Beauvois). Big Brown Bat.—Doubtless occurs throughout the region, as it is a widely distributed species, ranging over Austral, Transition, and lower Canadian life-zones. Miller quotes Brooks: "The brown bat is rare at Mount Forest." In a recent letter Mr. Saunders expresses himself of the belief that this species will now be found the common bat of this region, as it outnumbers all others combined at London.

28. **Myotis subulatus** (Say). Say's Bat.—Brooks reports this species common at both Mount Forest and Milton. I have a specimen from near Fergus. Gapper reported it "the most common bat in the home region" (Toronto, 1830).

29. **Myotis lucifugus** (LeConte). Little Brown Bat.—Nash writes:[10] "I have one record of this species from Wellington, where it was taken by Mr. Brooks." Mr. Saunders says it is common at London.

30. **Lasionycteris noctivagans** (LeConte). Silvery-black Bat.—Doubtless commonly distributed. Brooks records it from northern Wellington. I have several times seen dark bats which I have referred to this species. It is one of the common species at Toronto, where I have collected it.

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[9] Goldie, Alex., Ont. Nat. Sci. Bull., no. 3, p. 40, 1909.

[10] Nash, C. W., Vertebrates of Ontario. p. 91, 1908.

31. **Nycteris cinerea** (Beauvois). Hoary Bat.—Miller records Brooks as having found a dead bat of this species near Milton. It is likely of uncommon occurrence in Wellington and Waterloo Counties.

32. **Nycteris borealis** (Müller). Red Bat.—Doubtless occurs throughout the region as it ranges much farther north. Mr. Saunders finds it one of the common bats at London.

33. **Lutra canadensis canadensis** (Schreber). Otter.—Very rare, if occurring now at all. Brooks records it for northern Wellington in 1905. Mr. Saunders writes that some are recorded every few years from the London region.

34. **Mustela vison vison** Schreber. Mink.—Still generally distributed, but scarce.

35. **Mustela noveboracensis noveboracensis** (Emmons). New York Weasel.—The New York weasel ranges over at least the southern portion of the counties. It is quite possible that it goes somewhat farther north, as Saunders in a letter to me dated February 3, 1919, says: "I find that two skulls from Ottawa are of the New York weasel." *Noveboracensis* is the common species all over the southwestern peninsula of Ontario. The ranges of this species and *cicognanii* overlap in the southern part of Wellington and Waterloo Counties. In my collection is a male specimen of *noveboracensis* which I trapped a few miles north of Hespeler in Waterloo County on March 20, 1919. I have also taken the species near Rockwood in southeastern Wellington. The following interesting note is from A. A. Davidson of Guelph:[11] "As illustrating the difference in fauna between the northern and southern portion of Wellington County, the occurrence of *Putorius noveboracensis*, the New York weasel, is interesting. As will be seen by reference to another page, Mr. Allan Brooks found only *P. cicognanii*, Bonaparte's weasel, at Mount Forest. Here we have both; *cicognanii*, however, appearing to be much the commoner."

36. **Mustela cicognanii** Bonaparte. Bonaparte's Weasel.—This is the common weasel of the two counties. More numerous northwards. All specimens of weasels which I have from near Fergus are *cicognanii* and it is the only weasel recorded from northern Wellington by Brooks. I have one specimen of *cicognanii* which I collected near Preston on August 1, 1919, showing that it inhabits the entire region from south to north.

37. **Mephitis mephitis** (Schreber). Skunk.—Uniformly distributed and in parts very common. Probably more numerous in the south, as Brooks speaks of it as "scarce at Mount Forest; tolerably common at Milton."

38. **Procyon lotor lotor** (Linn.). Raccoon.—Still more or less commonly distributed, though of late years much reduced. In the wilder sections of southeast Wellington quite a number still occur.

39. **Ursus americanus americanus** Pallas. Black Bear.—Once common, but now found only rarely as a straggler in the extensive swamps of north Wellington and the neighboring district of Proton. The last bear my father saw in southern Wellington, township of Eramosa, was about the year 1877. Bears were probably exterminated in that part about 1880.

40. **Vulpes fulva fulva** (Desmarest). Red Fox.—Still frequently met with in the wilder and more sparsely settled districts. Almost completely exterminated in

[11] Davidson, A. A., Ontario Nat. Sci. Bull., no. 1, 1905.

some areas of close settlement and high cultivation, such as southern Waterloo, where practically the last were seen about twelve years ago.

41. **Canis occidentalis** Richardson. Timber Wolf.—Probably of very rare occurrence in the remotest localities at the northern end of Wellington County.

42. **Lynx rufus rufus** (Gueldenstædt). Wild Cat.—Probably still occurs rarely in the northern districts. Brooks lists the species as scarce in northern Wellington in 1905.

*Edmonton, Alberta.*

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## A CASTRATED ELK

By M. P. Skinner

[*Plate 28*]

The elk which is the subject of this sketch was born in June, 1917, and was perfectly normal in every way but had been separated from his mother and brought up at the Buffalo Ranch, Yellowstone Park. He was allowed to come and go as he wished, but, even when only a few months old, he was liable to attack almost anyone he saw, and when he was two years old it was deemed advisable to castrate him. At the time of the operation the elk had a set of horns, but they fell soon after and another pair began growing immediately. These horns were small in size, very crooked, and never lost the "velvet." They have been retained to date except that the left horn was knocked off when some of our men tried to drive the elk into a corral. During the winter of 1920–1921 these horns bled copiously whenever they were scratched; but at the time the horn was broken (not cast), curiously, there was little or no bleeding and the part remaining on the head was without velvet over the break for a long time. During 1922, a year after the break, the velvet grew up over the end of the broken horn, and since then both horns have swollen into club shape although neither has grown any longer. At the present time they bleed whenever scratched but do not seem to be unduly sensitive. This elk was allowed to roam anywhere until the fall of 1919, when he came to headquarters at Mammoth and caused so much mischief by eating clothes, rugs, clothes-line, magazines, and bundles that it was decided to corral him. Since 1919 he is allowed his liberty as long as he stays away from Mammoth but regularly each October he comes back of his own will, and is shut up after some little chasing, to be released again the following May. He seems inoffensive now, although I would never trust him myself. He is now five years old, full size, and his health seems good. He will not associate with other elk although I have seen him feeding within a few feet of them.

*Yellowstone Park, Wyoming.*

CASTRATED ELK, FIVE YEARS OLD

(Skinner: A Castrated Elk.)

# GENERAL NOTES

## MOLE NOTES

Doctor Jackson's interesting note on the habits of the mole in a recent number of the JOURNAL caused me to look up my own experiences with *Scapanus latimanus occultus*, several of which I have kept alive for some days after having "flipped" them out of their burrows with a hoe. Only once did I try feeding one on a non-meat diet, but it refused to notice sundry vegetables, fruits, and cereals, while another throve on bat (*Eumops* and *Eptesicus*) carcasses. My notes for March 18, 1918, read: "I have had a mole alive in a box for several days and have fed it worms and sow-bugs. He eats a prodigious quantity, and when I put food in with him is very fierce and makes a real battle of it all. He will grasp a worm and evidently crush it between his teeth, beginning at one end, progressing to the other, and back again. Then he will start, usually at the head, and munch it, meanwhile stripping it between his fore feet with a forward motion, partly to clean off the dirt and partly to force the mud from its intestine. He runs about his box very busily, using the sides of his hands, and poking his nose here and there at a great rate. After a meal, he usually sleeps, sitting on his hind legs, curling his head under him and resting partly upon his forehead. When I dangle a worm before him he becomes very ferocious, springing up on the side of the box and snapping. Once he caught my finger and remained suspended for almost a minute, but it hardly broke the skin. Unless he can support his fore feet, however, he seems unable to raise himself up, but tries to do so in a ludicrous manner, bending his back into a concave with all four feet clear of the ground. In ten hours I fed him 7 cutworms and 48 angle worms, some of the latter being six inches long, and he would eat ten of these at a meal." I found that a four-hour fast during the day would produce a definite weakening of the animal—more so than a foodless interval of eight or nine hours during the night.

Observing that my moles were fond of travelling with the feet of one side upon the perpendicular confines of their prison, I tried a few experiments with cardboard mailing tubes, long glass jars of small diameter, and boards nailed together at an acute angle. These showed conclusively that the awkward gait of the mole when travelling over a hard, plain surface is due to the fact that the legs are attached rather upon the *sides* of the animal than strictly beneath. They do not progress in an upstanding manner along their galleries as do the pocket gophers, but rather straddle the burrows with both the fore and hind limbs. This has undoubtedly been caused by their manner of digging, and is the result of the necessity for their bracing with the hind feet laterally, while using the fore feet for powerful side thrusts.—A. BRAZIER HOWELL, *Pasadena, California.*

## CARIBOU AND FOX

In the general notes of the JOURNAL for May are two articles on the friendly relations shown between caribou and foxes, and to these I would add an hear-say. J. G. Millais, the English sportsman and naturalist, in his "Newfoundland and its Untrodden Ways," tells the story of his hunting partner's observations, and I can do no better than repeat the written word. "My friend, Mr. John McGaw, witnessed an interesting exhibition of the playfulness of this animal (fox) shortly

after he left me on my third journey. He was stalking two stags on Serpentine Hills, near the Gander, when he noticed one of the stags staring stupidly and backing away from some object which kept leaping up from the ground at its side. On approaching to within eighty yards of the deer, he saw that the curious object was a young fox engaged in an attempt to make the larger animal have a game with him. The fox repeatedly sprang into the air, snapping at the deer's side, and then, as these manoeuvres were resented by the stag lowering its head to strike, it rushed around to the other side to repeat the performance. The nimble game went on for several minutes, Reynard apparently enjoying the fun of chaffing his clumsy friend, who did not appear to appreciate the joke in the slightest degree. Sometimes it bounded forward as if to seize the stag's nose, and then as quickly sprang backwards, standing just out of reach in the most provoking manner. My readers will be glad to hear that this merry little fellow retreated in safety." Millais reproduced the incident in a drawing.

While I have hunted caribou both in Newfoundland and Alaska, I was never fortunate enough to see caribou and foxes in close relation.—CHARLES A. GIANINI, *Poland, N. Y.*

### BUFFALO IN OREGON

In the early part of the nineteenth century buffalo were found well across the plains of southern Idaho, and Doctor Allen records the bones of one found by Prof. O. C. Marsh in 1873 on Willow Creek in the southeastern foothills of the Blue Mountains of Oregon. In 1915 when engaged in Biological Survey work, E. A. Preble obtained records of buffalo skulls and bones found near the Cow Creek Lakes and procured an old horn picked up by Mr. W. F. Schnabel on upper Cow Creek in eastern Malheur County.

During the summer of 1920 in the entrance of the big Malheur Cave, 16 miles southeast of Malheur Lake, I picked up several fragments of bones and some teeth which I recognized as the remains of buffalo, and my field identification has been verified by Dr. J. W. Gidley of the U. S. National Museum. These fragments are probably the westernmost specimens of the living species of *Bison* in North America.

In 1826 Peter Skene Ogden, in charge of a party of trappers, discovered Harney Lake, which he graphically describes in his journal entry of November 1, and he says "Buffalo have been here and heads are to be seen." This carries them fifty miles farther west than the Malheur Cave and I believe gives the westernmost record for buffalo in the United States.

In 1916 Captain Louis, then a chief of the Piute band of Indians near Burns, and formerly a scout under General Crook, told me that there used to be buffalo all over the Malheur Valley. He thinks he is about 70 or 80 years old and says he was a young man, not married, at the time of the Modoc War (1872). He says his grandfather was here when there were plenty of buffalo over the valley; that they went into the mountains in summer and came down into the valley in winter and were hunted by the Indians. He can remember when a boy seeing some of the very old men with much worn buffalo robes and says he has found buffalo bones and horns in Malheur Lake when it was unusually low. His grandfather had told him of the buffalo going away and he thinks they left about 100 years ago, but his dates are not very definite. The Indians followed the gradual retreat of the herds

east to Crane Creek, to the Malheur River, and then across Snake River, over to the Bannock country, where our records begin nearly 100 years ago.

These Indians still have a song calling the buffalo to "come back, come back and do not go away again." They sing it with the drum as they dance, and try to keep alive the flickering flame of ancient lore.—VERNON BAILEY, *Biological Survey, Washington, D. C.*

### KANGAROO RATS AND SCORPION MICE ON THE SANTA RITA RESERVE, ARIZONA

On February 15 and 16, 1923, we spent parts of two days on the United States Range Reserve at the west base of the Santa Rita Mountains, thirty-five miles south of Tucson, Arizona, trapping *Dipodomys spectabilis* and working on the life history of the jack rabbit. The night of February 15 was warm, clear, and favorable for kangaroo rat activity, and we put out thirty-five traps, baited with walnut meats and rolled oats, all on mounds apparently occupied by *Dipodomys spectabilis*. Eleven specimens of *spectabilis* were taken; and the complete disappearance of traps in three additional instances possibly justifies the suspicion that those caught had been carried away by some predatory animal. In one case a few scattered fragments of a kangaroo rat remained, its attacker having consumed it almost on the spot were trapped. In another place where a trap was missing fresh feces of the kit fox, or swift (*Vulpes macrotis* ssp.), largely composed of the hair of *Dipodomys spectabilis*, indicated the probable culprit. The feature which makes the night's trapping of most interest, however, was the capture of a pair of kangaroo rats on each of two mounds. As a rule one animal only is taken at a mound; but as this time of year falls well within the known breeding season of this species the taking of pairs of the animals at a given mound would not be unexpected. We seem to have no previous records of the capture of pairs of rats at the same mound the same night.

During the summer of 1921 the *Dipodomys spectabilis* on the reserve were systematically poisoned over most of the area. The characteristic mounds remain conspicuous, of course, and many, if not most of them, have been taken over by other species of rodents. Conspicuous among the latter is *Dipodomys merriami*, which seems not to have suffered from the poisoning as did its larger relative, but which, on the other hand, is apparently improving its opportunities for better "housing."

Almost as soon as we entered the unoccupied supply tent at McCleary's Camp, in which miscellaneous camp supplies had been left over for some weeks, we heard squeakings and saw gray shadows which indicated the presence of mice. In the traps in the morning, instead of the *Peromyscus* anticipated, we found no less than four *Onychomys*, and no white-footed mice at all! Apparently the scorpion mice had driven out the *Peromyscus*, the first instance of the kind that has come to our notice. One of the scorpion mice was caught by the foot, and its squeaking, in the trap, was far more musical and longer continued than that of *Peromyscus*. The scorpion mice became active almost as soon as night fell, and apparently had difficulty keeping under cover even while a powerful gasoline lamp was illuminating the interior of the tent; and, in fact, one was caught in the open during the evening while three men were engaged in animated conversation, and near the foot of one of the party.—WALTER P. TAYLOR AND CHARLES T. VORHIES, *Tucson, Arizona.*

### A SWIMMING WOODCHUCK

The notes on the swimming woodchucks remind me of a similar experience back around 1900 at Belgrade, Maine. I was fishing with a companion in a boat anchored at the mouth of a stream which came into the big Belgrade Lake. This stream was about 75 or 100 yards wide as near as I can remember. Looking a few yards up stream we saw a woodchuck enter the water on the left bank and start to swim across a little way up stream from the boat. I think there is no doubt that this was an absolutely voluntary action. When the animal was about opposite the boat I started casting my line over him and, after one or two attempts, hooked him and reeled him aboard. We hung the beast in with a string of black bass and carried him back to the hotel, where our story (slightly elaborated) caused considerable skepticism. Nevertheless it was true in the main. I have never seen a woodchuck in the water since then.—JOHN C. PHILLIPS, *Wenham, Mass.*

### ANOTHER SWIMMING WOODCHUCK

I was intensely interested in the observations, by Doctor Merriam and Charles Eugene Johnson, of woodchucks in the act of swimming, printed in the Journal of Mammalogy for May, 1923. I am glad to offer an observation of my own along the same line.

One summer morning several years ago, as I approached the bend of a woodland stream, I saw a woodchuck slip through the undergrowth and plunge down the bank of the stream into the water. He dived like a muskrat, and in the clear water I could see him a foot or more under for several yards before he came to the surface. He then swam for several rods in a half circle with head and shoulders out, and, landing on the same bank, disappeared among the bushes.

This is the only instance of a woodchuck swimming that has come under my observation.—WILLIAM EVERETT CRAM, *Hampton Falls, New Hampshire.*

### WOODCHUCKS AND CHIPMUNKS

In reading over the JOURNAL for May, I note two articles to which I may contribute a fragment of information.

First, as to the aquatic habits of the woodchuck. In front of my home in Nelson County, Virginia, the James River is over 100 yards wide, and, at that particular spot, the river bottom is all on the north side, the south side being a precipitous, rocky bluff. In this bluff there are a number of woodchucks, but the vegetation, laurel thickets and large trees, does not furnish them with a food supply comparable to that on the cultivated land on the opposite side. They, therefore, frequently swim across, feast on corn, clover, melons, etc., and then swim back. I have several times seen them do this and on June 18, 1899, I overtook one with a boat and captured it in the middle of the river.

Second, as to Mr. Howell's query about hibernating chipmunks. At this place, West Point, New York, on March 15, 1907, the weather very cold and the Hudson River still frozen over, on my way to my office, I passed some workmen who were moving a large boulder which was threatening to slide down into the roadway. As they rolled it over, I saw underneath it the galleries of some small animal and, in one corner, a ball of dried leaves. On opening this, I found inside a chipmunk, tightly coiled up, eyes closed, cold to the touch and stiff and rigid. I

moved it to another spot, placed it where the sun would strike it and covered it with some dry leaves. Two hours later I returned and found it with its eyes open, but still stiff and unable to move. I put it in my overcoat pocket which I hung up in the warm building for an hour or so and forgot about the chipmunk. In putting on the coat later, I slipped my hand into my pocket and the chipmunk promptly bit me severely, its incisors passing through my finger nail. When I reached a suitable spot, I released it and it scampered off, now perfectly alert.

Apropos of Mr. A. B. Howell's paper on mammal collections, if it be of any interest, I have collected in a desultory way for upwards of 25 years and have at my home in Virginia some 750 specimens of about 125 species, mainly from Virginia and New York, but also from Venezuela and West Indies.—WIRT ROBINSON, *Colonel, U. S. A., West Point, New York.*

### A NOTE ON THE WINTER HABITS OF EUTAMIAS TOWNSENDII

Having read Mr. Arthur H. Howell's communication in the Journal of Mammalogy for May, concerning the hibernating habits of chipmunks, I am prompted to offer the following note:

On January 2, 1920, while removing a very large decayed spruce stump from a beach lot at Netarts, Tillamook County, Oregon, I examined the winter quarters of an Oregon chipmunk (*Eutamias townsendii*). The nest chamber, situated about five feet above the ground and one foot from the outside of the stump, was well filled with dry grasses and moss. No supply of food was found in the vicinity of this nest. The occupant of the nest was dormant and lay curled up so cold and stiff that it could hardly be straightened. It was carried several miles in a box, but did not become active until, some hours after being removed from the nest, it was placed in a warm room. Later in the day it escaped.

During warm sunny periods in winter these chipmunks are occasionally seen, but not in numbers. It might be noted, however, that it was at such a time that the above mentioned individual was found, and that the stump which contained the nest was in a sunny location. This would indicate that not all chipmunks respond to the call of warm midwinter days.—ALEX. WALKER, *Blaine, Oregon.*

### NOTE ON A FEEDING HABIT OF THE GRAY SQUIRREL

During the past twenty years I have noticed frequently an interesting habit of the Carolina gray squirrel, *Sciurus carolinensis*, which does not seem to have attracted much attention among observers of this animal. The habit is that of gnawing the outer bark on a small area of the trunk of large, leaning trees of our native chestnut, *Castania dentata*. Only one spot occurs to the tree and this is usually from one to ten feet above the ground and always on the side toward which the trunk of the tree inclines. Frequently the gnawing is confined to one ridge of the thick bark, when it may extend for six or eight feet along the trunk. The gnawed area shows red against the normal gray trunk and is noticeable to a considerable distance.

In the several hundred acres of chestnut woodland which surrounds my home at French Creek, West Virginia, there is scarcely a single old chestnut tree above two feet in diameter, providing the tree-trunk leans to a considerable extent and has a dead and decaying top, that does not bear one of these gnawed areas. The

gnawing is done a little at a time and may continue over a period of many years. On one occasion I observed closely a squirrel while engaged in the act. It hung head downward by its hind feet over the spot and bit off pieces of the bark which it held with its fore feet and chewed into fragments. Some of the fragments were dropped, but, apparently, portions were swallowed. That the squirrel was not obtaining insect food nor gathering nest-building material was apparent.

Quite recently I have observed two of these gnawed spots on trees other than chestnut; one on chestnut oak, *Quercus prinus*, and the other on white oak, *Q. alba*. In both these cases the trees were old and the scarified areas occurred just beneath large, warty excrescences on the trunk from which there had been a seepage of dark-colored liquid, probably rich in tannin. This liquid had flowed downward, and, in drying, had left a deposit which stained the bark. This stained surface had been partially eaten away by squirrels. On the white oak the excrescence was about eight feet up the trunk and the surface of the bark between it and the ground had been gnawed over to the extent of several square feet. On the chestnut oak the excrescence was only two feet above the ground and the gnawing beneath it was less extensive, although very distinct.

Apparently on both the oaks and chestnut the gnawing is done because of a taste agreeable to the squirrels which is imparted to the bark by the drying of sap or impregnated rain-water flowing down from diseased or dead wood above.—Fred E. Brooks, *French Creek, W. Va.*

### NOTES ON A FEW MICE, RABBITS AND OTHER ANIMALS

Between the last of February and the last of April, 1922, in company with Ranger Dalton, I spent several weeks at an out-of-the-way ranger station on the Colorado National Forest. Upon arrival we found the snow drifted well up on the windows so that the mice had cut a number of runways in the snow next to the glass. We removed a small amount of snow, making it slope back from the window enough to feed crumbs to the mice and thus be able to watch them better.

The following made their appearance: *Evotomys* (sp), red-backed mouse; *Peromyscus* (sp), white-footed mouse; and *Microtus* (sp), field or meadow mouse. The red-backed mice made their appearance throughout the day and evening, the field mouse (there was but one) made its appearance occasionally through the day but most frequently in the late afternoon, especially at dusk. The white-footed mice were rarely seen during the day but always put in an appearance about an hour after dark.

The red-backed mice soon became indifferent to our movements in the cabin and ran about in their feeding, regardless of what we were doing. The field mouse was extremely shy, while the white-footed mouse seemed to be less so, but more wary than the red-back. This applied only to the day, for at night a lamp stood next to the windows and prevented the mice from seeing into the cabin and they were indifferent to any sound we might make (such as the clatter of washing tin dishes within a few feet of the window). A particularly loud noise caused them to pause and smell a bit, but as they were unable to catch scent through the glass they usually resumed their feeding.

The red-backed mice, which were most numerous, knew no kin; whenever two of them met they fought, usually by jumping and kicking at each other, though

at close quarters they sometimes used their teeth to cut and strike with. One pair used their fore paws to fence with while trying to slash with their teeth. There was a constant movement as one after the other held the field. When eating, these mice held the larger pieces with their forepaws; the smaller crumbs they ate directly from the ground. The red-backed mouse was the weakest of the three species and fled precipitately upon the approach of either of the other two. The longest jump observed, made by a red-backed mouse upon the appearance of a white-footed one, was from up on the snow to the lower corner of the window. The distance was between 2½ and 3 feet, with a drop of about 15 inches.

The field mouse was seen but seldom. It rarely paused to eat crumbs but was content to gather as much as it could at one time and scurry back to its hold, there to eat at leisure.

The white-footed mouse ate in a leisurely fashion, both by picking crumbs from the ground and occasionally holding some in its paws. There was apparently a family of these, two large older ones, and two or three half-grown young. These did not fight among themselves. It might be well to add that within a night or two the mice had honeycombed the drift so that holes appeared in about eight places in the snow. Only the field mouse used one particular burrow; the others appeared to use any or all of the runways and holes.

After two weeks, the snow was cleared away from the window and levelled back for about two feet from it. This made the field mouse and white-footed mouse extremely wary but did not seem to bother the red-backed mouse, which ate crumbs in the open, both night and day. A few nights later a small screech owl caught a red-backed mouse and started to devour him on the spot, but the light from the lamp and sounds from within the cabin caused the owl to become bewildered. He finally made off with his catch. About a week after the snow had been levelled back from the window a weasel was seen early one morning. No more mice appeared for nearly two weeks, when finally the white-footed mice again put in a timid appearance.

About the same time that the weasel came, snow shoe rabbits appeared on the scene. These came only at night and ate crumbs and bits of apple. They fought among themselves, never more than one feeding at the place at one time. These rabbits put in an appearance and ate when the men inside the cabin were sitting within a few feet of the window. Here again the lamp prevented them from seeing within. The rabbits would sit up and listen at any marked sound, but usually went on feeding. They frequently hopped along the window with their noses sniffing up and down the glass, which leads the writer to infer that the rabbit was unwilling to credit his ears unless he could either see or scent the cause. At night the rabbit seems to place his greatest reliance on scent.

After the rabbits put in an appearance, oats were put out for them. The first two or three nights the oats were untouched, although all the crumbs of food and table scraps were picked out and eaten. The station is at an elevation of 9,000 feet and while there are a few scattered hay ranches in the region, no grain is raised there. Crumbs were constantly added to the oats and it was several days before the rabbits began to hull oats and eat them. Once they learned how, the oats rapidly disappeared.

During cold weather, no chipmunks were seen. With the first of April a change in weather took place. Chinook winds caused rapid melting and settling

of the snow and about the 5th of April one lone chipmunk put in an appearance.—LEE P. BROWN, *Fort Collins, Colo.*

## NOTES ON PRAOTHERIUM PALATINUM COPE

A fossil ochotonid from the Pleistocene Port Kennedy beds of Pennsylvania was described in 1871 by E. D. Cope, who named it *Praotherium palatinum*. Cope later (1883) placed this form in the genus *Lagomys* (*Ochotona*), and in this allocation of the species he has been followed by most later authors.

The type and only known specimen of this species consists of a palate with four cheek teeth on each side. It was originally part of the Cope Collection, and is now no. 8574, Department of Vertebrate Paleontology, American Museum of Natural History. It was collected in 1870, by Wheatley, in the Port Kennedy deposit. Through the courtesy of Dr. W. D. Matthew I have recently had an opportunity to examine this specimen. The fossil is much deformed by pressure. Although the teeth are present in apparently their original form, they are very fragile, and it is impossible to clean them thoroughly or to make out clearly their enamel patterns. However, the aid of Mr. Christman, an experienced preparator, was secured, and the faces of several of the teeth were cleaned as much as was safe.

The first molariform tooth in the fossil is not conspicuously smaller than the second, as is the case with the first upper molariform tooth ($p^2$) of modern *Ochotona*. It is possible that an anterior tooth in the fossil may be missing, and that the first tooth now found is $p^3$, but from the indications on the palate this is not likely the case. Also, no trace can be found on this first tooth, or on the other cheek teeth present, of the conspicuous enamel crescent found on $p^3$ of modern *Ochotona*. The condition of the fossil teeth makes it impossible to be sure that this crescent was not present in life, but it is not probable.

The reentrant angles of the cheek teeth of the fossil seem to have extended little more than half way across the teeth, instead of nearly the whole distance across as in $p^4$, $m^1$, and $m^2$ of modern *Ochotona*. There is some indication in the fossil that the inner portions of the reentrant angles of the cheek teeth were rather strongly crenulated or folded, but the condition of the teeth makes it impossible to be certain about the enamel pattern here.

The evidence at hand seems to be sufficient to show that at least the fossil is distinctly different in its teeth from the living species of the genus *Ochotona*. Until more is known about the structure and relationships of the fossil it seems best, therefore, to use for it Cope's earlier name of *Praotherium palatinum*.—L. R. DICE, *Museum of Zoology, University of Michigan, Ann Arbor, Mich.*

## FOOD HABITS OF THE PACIFIC PALLID BAT

During the first week of September, 1922, while at Mission San Antonio de Padua, Monterey County, California, with the University of Michigan-Walker Expedition of 1922, I collected several bats of the species *Antrozous pacificus*, and was able to make an interesting observation on their food habits.

There were several bats hanging between the adobe wall of the abandoned mission building and some sheathing boards that were about twenty-five feet above the ground. Five of these were taken with a shot pistol, and it was found

that they did not drop until their muscles had relaxed, usually a matter of several minutes. Below this roost there was a line of feces but no insect fragments were present.

In a niche in the roof of an underground brick tunnel, once the outlet of the flume in the mission mill, about three hundred yards from the other roost, was found one more bat. Under this roost was a very deep line of feces and a great many insect fragments, mostly Jerusalem crickets (*Stenopelmatus fuscus* (Haldeman)) and scorpions (*Anuroctonus phaiodactylus* Wood). There were also fragments of a few other insects among which were identified a grasshopper (*Schistocerca* sp.) and a beetle (*Polyphylla decemlineata* Say).

Mrs. Grinnell[1] also found the Jerusalem cricket most numerous in midden heaps of this bat, while Doctor Nelson[2] describes a very interesting case in which an *Antrozous pallidus* was caught while capturing a stenopelmatid on the ground. I have been able to find no reference in the literature, however, of scorpion fragments being found. It is difficult to understand how these bats capture the scorpions without being severely hurt or killed, for the venom of this scorpion is poisonous enough to kill most mammals of this size and the physical injury of the injection alone should be a serious matter to so small an animal. These scorpions are able to bend the postabdomen to such a wide range of positions that it would seem impossible that the bat could avoid being stung the greater number of times that it captured such prey. It is possible then that this bat is immune to the venom of a scorpion. Mr. W. H. Wilson[3] carried on experiments with several mammals of the Egyptian desert and found some of them to be immune, but none of the animals experimented upon were Chiroptera. The small size of the bat would preclude the possibility of immunity being individually acquired, so that if these bats do possess an immunity it must be an inherited one.

I am indebted to Mr. Nathan Banks of the Museum of Comparative Zoology for the identification of the scorpions, to Mr. Theodore H. Hubbell of Bussey Institute for the identification of the Jerusalem crickets and the grasshopper, and to Mr. Frederick M. Gaige of the Museum of Zoology for the identification of the beetle.—Robert T. Hatt, *Museum of Zoology, Ann Arbor, Michigan.*

## CAUDAL AND PECTORAL GLANDS OF AFRICAN ELEPHANT SHREWS (ELEPHANTULUS)

In a recent article Semichon[1] describes the glandular pad on the under side of the tail of *Elephantulus rozeti* which consists of sebaceous and sudoriparous glands. After presenting a discussion on two sections of the gland he comes to the conclusion that this glandular pad serves to reduce the shock transmitted to the vertebral column whenever the tail of the jumping elephant shrew hits the ground.

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[1] Grinnell, Hilda Wood. A synopsis of the bats of California. Univ. of Cal. Publ. Zool., vol. 17, no. 12, 1918, pp. 235 and 355.

[2] Nelson, E. W. Smaller mammals of North America. Nat. Geog. Mag., vol. 33, no. 5, May, 1918, p. 493.

[3] Wilson, W. H. The immunity of certain desert mammals to scorpion venom. Proc. Physiological Soc., London, Jour. Physiology, vol. 31, pp. 1–111.

[1] Le Renflement Caudal du *Macroscelides rozeti* Duvernoy. Bull. Soc. Zool. France, vol. 47, pp. 466–469; 2 figs. 1923.

Only males were dissected. He did not find any excretory tube discharging at the surface of the pad, but observed some tubes opening into enlarged cavities directly beneath the corium, where the ducts of the sebaceous glands empty.

It is probable that if Semichon had had at his disposal better prepared material he might have discovered some excretory tube leading directly to the surface of the skin. The position of this glandular pad on the under side of the tail at a point which, as Semichon states, is touched the moment the animal jumps or lands, is suggestive of its belonging to the type of secondary sexual glands. Excretions discharged from them, usually strongly scented, at times of particular excitement or during the breeding period, indicate to companions the direction in which the animals have passed or can be found. The elephant shrew in question lives in the hilly regions of the Atlas range and is known to hide in rocky crevices.

R. Wagner,[2] who apparently was the first to describe these bottle-shaped glands of *Elephantulus rozeti*, says that they show distinct openings on the surface and that to them must be ascribed the peculiar odor given off by this elephant shrew. He compares these glands of *Elephantulus* with a similar structure in *Myogale*, which was described by Brandt in 1836.[3] Peters[4] also recorded a caudal gland in an adult *Elephantulus rupestris intufi* from Mozambique.

Glands of a similar character are also recorded from other groups of Macroscelididæ. Heller[5] was the first to use the presence or absence of a gland as a basis for the arrangement of the members of the genus *Elephantulus*. He states that "a large chest gland covered thickly by short white hair in both sexes. . . . occurs in specimens from northern German East Africa northward to Somaliland and Abyssinia." Such a chest gland I also found to be present in *Nasilio fuscipes*[6] from the Uele District, northeastern Belgian Congo, a member of the genus nearest related to *Elephantulus*, the glandular area being less developed in females than in males.

These pectoral glands occur in regions where the environmental conditions would be favorable for the transmission of odors from such glands, by leaving traces upon the parts of the vegetation they touch as the shrews scurry through, and would thus take an important part in the guidance of sexual instincts. The difference in location of these glands under different ecological conditions is suggestive of their great importance as regards the reproduction of these animals and continuance of their kind. Surely a caudal gland would be of little use in grass country, and a pectoral gland would be equally unsatisfactory upon the stony ground over which the elephant shrew bounds.

Structures resembling somewhat the pectoral glands of *Elephantulus* are the lateral glands of shrews (Soricidæ). They have given rise to an extensive literature, but nearly all authors agree in considering them as secondary sexual organs though incidentally they may have also protective value. Johnsen[7] states that

[2] Wagner, Moritz. Reisen in Regentschaft Algier, vol. 3 (Mamm.), p. 12 footnote. 1841.

[3] Act. Ac. Caes. Leop. Carol. Nat. Cur., vol. 18, pt. 1, p. 243. 1836.

[4] Reise nach Mossambique, p. 89. 1852.

[5] Smithsonian Misc. Coll., vol. 60, no. 12, p. 11. 1912.

[6] Allen, J. A. Bull. Amer. Mus. Nat. Hist., vol. 47, art. 1, p. 38. 1922.

[7] Anat. Anz., Jena, vol. 46, pp. 139–149. 1914.

there is a parallel development in the growth of the testes and the lateral gland and also that there is no full development of this lateral gland in gravid females. Stamm[8] gives probably the best account of these glands and differs, at least as regards *Sorex araneus*, from Pocock,[9] who believes that the lateral gland is absent in females of the British species of *Sorex araneus*, *S. minutus* and *Neomys fodiens*, but present in both sexes of the Indian *Crocidura cærulea*.—HERBERT LANG, *American Museum of Natural History, New York.*

### BREEDING DATES OF SMALL MAMMALS AT RALEIGH, NORTH CAROLINA

Opossum (*Didelphis virginiana*). Seven very small naked young taken from the pouch of a female on March 11, 1895. (A similar lot of seven from the pouch of another from Union County, North Carolina, February 20, 1897.) Fourteen well-furred young (272–290 mm. total length) caught in hollow at base of tree together with an adult female on August 4, 1891; seven of these had the long hairs mainly black, and the other seven had them mainly white.

Cottontail Rabbit (*Sylvilagus floridanus mallurus*). Four very small embryos taken from a female March 11, 1901; five embryos from another on June 5, 1901. Four young (167–215 mm.) taken July 4, 1892, and two more two days later. The young are born naked and blind and are cared for by the mother in a fur-lined nest on the surface of the ground.

Flying Squirrel (*Sciuropterus volans*). Three lots of two young each, one lot of three and one of four taken in April of 1891 and 1892. (One lot of three from Bertie Co., North Carolina, March 20, 1893.) One lot of four young September 10, 1892. The young all came from nests in hollow trees or limbs sometimes only a few feet from the ground, sometimes high up.

Jumping Mouse (*Zapus hudsonius americanus*). One lot of seven embryos September 17, 1891, and one lot of eight young taken with an adult female June 13, 1895.

House Mouse (*Mus musculus*). Embryos taken from June to October, inclusive, and in December; small young taken in May. Average to a litter five, largest number eight.

Roof Rat (*Rattus alexandrinus*). Embryos in March, July and August; average to a litter five, maximum seven. This species still lingers on here, although since 1909 it has been replaced as the common "house" rat by *Rattus norvegicus*.

Deer Mouse (*Peromyscus leucopus*). Embryos in January, March, April, July and November; three or four to a litter. Nests in rotten stumps, either above or below ground; nest of grass and other soft material often including feathers.

Golden Mouse (*Peromyscus nuttalli aureolus*). Embryos in April, June, August and September; young in September. Nests in bushes, low trees, or reed thickets at a height of from three to twelve feet.

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[8] Über den Bau und die Entwicklung der Seitendrüse der Waldspitzmaus *Sorex vulgaris* L. In: Mindeskrift f. J. Steenstrups, Kobenhavn, vol. 2, art. 28, pp. 1–23, 2 pls., 17 figs. 1914.

[9] Field, London, vol. 122, pp. 467–468. 1913.

Ricefield Rat (*Oryzomys palustris*). Embryos in March, April, June, July, August, September, and November; young taken in May, August and October. Three to seven in a litter, average five. Nest often built in cat-tails (*Typha*) surrounded by water.

Harvest Mouse (*Reithrodontomys humulis*). Embryos in May and November, young in July. Two to five in a litter. I once found a nest in a bulrush tussock, and once I dug a pair out of an underground nest in late fall.

Cotton Rat (*Sigmodon hispidus*). Embryos in January, May, July and October. Three to nine to a litter, average six.

Meadow Vole (*Microtus pennsylvanicus*). Embryos in January, March, April, October and November; young in January, June, November and December. Three to six in a brood.

Muskrat (*Fiber zibethicus*). Two embryos (very small) from a female March 7, 1895, and one from another, July 19, 1897.

Common Mole (*Scalopus aquaticus*). Embryos in March, April and May. Number, in five litters, two to four.

Carolina Mole-Shrew (*Blarina carolinensis*). Three pregnant females taken, one each in March, April and July; two litters of three each, one of five.

Little Mole-Shrew (*Cryptotis parva*). Three females with embryos, one each in February, May and September; three, four and five to a litter.

Red Bat (*Nycteris borealis*). Eleven gravid females taken in May and one in April, all but one with three embryos each, the remaining one with only two.

Georgia Bat (*Pipistrellus subflavus*). Twenty-one females with two embryos each and three with one each, all taken in April and May.

Twilight Bat (*Nycticeius humeralis*). Three females with two each, two with one each, in April and May.

Brown Bat (*Eptesicus fuscus*). One gravid female taken May 3, 1902, but number of embryos not recorded.

Mink (*Lutreola vison lutreocephala*). A female with 6 embryos taken March 6, 1893, and another accompanied by three young (307–325 mm. long) on May 17, 1897.—C. S. Brimley, *Raleigh, North Carolina.*

### CYCLES OF ABUNDANCE AND SCARCITY IN CERTAIN MAMMALS AND BIRDS

A subject of great interest to sportsmen and naturalists, is suitable protection of game birds and mammals, but too often laws are enacted which do not take into consideration the conditions which nature has imposed on the increase and decrease of certain species. The ideal law is one which, while conserving the species, allows a reasonable number to be taken for study, recreation, and food. While legislation can do much it cannot go against nature and I propose to show some of these instances as they apply to Alberta in particular.

The varying hare is not of much importance from a sportsman's standpoint and in Alberta it is not protected. As a source of sustenance for various fur-bearing animals, however, it is of the very first importance, as when these hares are plentiful, meat-eating fur-bearers are also plentiful. This is especially true of the lynx, coyote, and fox. Birds of prey, also, show a marked increase when hares are plentiful. While the hares remain abundant all carnivores prey upon them, and as they have no difficulty in procuring them, they prey to a lesser extent on

game birds, giving the latter a chance to increase in numbers. So that, everything considered, the varying hare must be looked upon as an animal of the very highest importance. In order to show just how important it is to the fur trade the following figures may be of interest. In the seasons of 1905–6 and 1906–7, when hares were very abundant, I bought at Pembina River 860 and 980 lynx skins, in these two winters. In the spring of 1907 the hares died off and in the season of 1907–8 I received only 40 lynx skins from the same territory.

The question naturally occurs: Would it not be possible to protect the varying hare by legislation and thus ensure a steady supply of the fur-bearers which live upon it? A man who knew little of the actual facts of the case, such as the average M.P., would say, "Certainly," and would proceed to have a law passed to protect the varying hare. For the sake of the argument we will suppose that complete protection could be given them. Would this not conserve them? Most certainly it would not. Legislation would not prevail against a law of nature which ordains that the varying hare reach its maximum abundance about every seven years, remain plentiful about two years, and then suddenly almost die out. No man-made law could alter this law of nature.

If scientists could find a method of making the hares immune to the disease which carries them off when their numbers become excessive, then they could be protected. Though in that case they would need no protection, as the natural rapid increase would secure an abundant supply of these animals and consequently of the fur bearing animals which live upon them.

Other mammals and birds are subject to similar cycles of increase and decrease, through natural causes over which man has no control, though perhaps not to such a marked extent as are the varying hare and the animals which live upon it. The muskrat, for instance, increases most rapidly in wet seasons which seem to be favorable to it, as more water and more food are available. There is also a high death rate among muskrats during the winter months as they are never so numerous in spring as in the preceding fall. In some seasons this is very marked, as they die out almost to the vanishing point. This was very noticeable in the Peace River District in 1915–16. In the fall there were thousands of them, but on a prolonged hunt in the spring less than one hundred skins were secured.

Among birds the ruffed and sharp-tailed grouse also have their cycles of abundance and scarcity, increasing through a period of years until they reach their maximum numbers and then dwindling suddenly to a condition of scarcity.

In view of these facts it will be seen that, while legislation can help, it cannot alter these natural conditions and care should be taken that it should be based on a knowledge of the life-history of the species it is desired to protect. The ideal system would seem to be to give complete protection in the natural periods of scarcity and a liberal open season and bag limits in the period of abundance. In fact, it would seem that when the numbers of a species approach the maximum, a considerable reduction in numbers would be advantageous to the species rather than otherwise. This of course applies only to species of birds and mammals in territories where these cycles of abundance and scarcity occur.—A. D. HENDERSON, *Belvedere, Alta.*

## CORRECTED TYPE LOCALITIES OF SOME CALIFORNIAN MAMMALS

Type localities of a number of Californian mammals are not recorded as precisely as could be desired, and in a mountainous locality such lack of precision may prove most exasperating to one bent upon collecting topotypes, even though he may be less than a mile off in his reckoning. Localities of the following mammals fall in this class, and search through the field records of the Bureau of Biological Survey and enquiry among the collectors of the specimens, now enable them to be better defined.

*Sorex tenellus tenellus* Merriam. Type locality usually given as the "Summit of Alabama Hills near Lone Pine, Inyo County, California." This small range of arid hills is situated between the Owens Valley proper and the main Sierra Nevada, but is perfectly distinct from the latter. Lone Pine Creek descends from the Sierras and cuts entirely through the Alabama Hills at Lone Pine. The field catalogue of E. W. Nelson gives the locality as "upper edge of Alabamas" for the type as well as for several other mammals taken the same day, such as *Microtus*. Hence, the type locality of this species may with propriety be given as Lone Pine Creek (about 4500 feet), Owens Valley, Inyo County, California. The type of *Microtus californicus vallicola* Bailey was also secured at the "upper side of Alabamas," so its locality is the same as for *Sorex t. tenellus*, instead of merely Lone Pine.

*Sorex tenellus myops* Merriam. The field entry of Doctor Nelson for this type reads "5850′ above Lone Pine Camp at 3638′," "near main peak on Pipers Creek (Cottonwood Creek)," "E. slope." The corrected altitude of Lone Pine is 3727 feet; hence the type locality should be given as Cottonwood Creek (about 9550 feet) on east slope of the White Mountains, Inyo County, California.

*Sorex vagrans amœnus* Merriam. Type locality heretofore stated as "Mammoth Pass, 10,000 feet altitude, Mono County, California." There seems to be no foundation for this, as Doctor Nelson's field entry for the type reads "Sierra Nevada Mts., Cal., near Mammoth at head of Owens River," "4400′ above Lone Pine camp at 3638′." In his manuscript report of the region it is stated that the species was secured "in a small meadow in pine forest at the head of Owens River, altitude 8400′." This form is an animal of the lower meadows, and I, being familiar with the locality, think I know just where the type was caught, although the small meadow I have in mind is nearer 8100 feet in altitude. Be that as it may, it is safe to state that the type locality is somewhere in the immediate vicinity of Mammoth (8000 feet), Mono County, California.

An examination of notes and a conversation with Mr. Vernon Bailey bring to light the information that for *Mephitis platyrhina* (Howell) and *Citellus beecheyi fisheri* (Merriam) the type locality is South Fork of Kern River 3 miles above Onyx, Kern County, California.

For *Peromyscus crinitus stephensi* Mearns, the given type locality of "lowest water on wagon road in canyon at east base of the Coast Range, near Mexican boundary, San Diego County, California" is anything but satisfactory. I find that the type specimen was secured at a camp made 3 miles east of Mountain Spring, San Diego County, California.—A. Brazier Howell, *Washington, D. C.*

# RECENT LITERATURE

BORRADAILE, L. A. THE ANIMAL AND ITS ENVIRONMENT. A TEXT-BOOK OF THE NATURAL HISTORY OF ANIMALS. 8vo; Oxford University Press, American Branch, New York; vi + 399 pp.; 4 colored plates; 426 figs. in text. $5. 1923.

The purpose of this interesting book is to present more fully than can usually be done in a book on general zoölogy, an account of the conditions under which animals live, that is a survey of the physical factors affecting their ordinary existence and the modifications which they have undergone in meeting these factors; the interrelationships between different sorts of animals, how they affect one another whether adversely or helpfully, and whether of the same or different species, the same or opposite sex, and many similar questions. It is essentially a series of lectures, representing a course given by its author at Cambridge University, England. A few of the chapter-heads indicate briefly its scope. The organism as an object in Nature; Physical factors which affect the lives of animals; Special relations between animals and plants; Relations between animals of different species; of the same species; Fauna of the sea; The fresh-water fauna; The land fauna; The evolution of faunas; Internal parasites. It is thus primarily a text-book for students, yet makes good general reading as well, and presents in an interesting way a mass of facts culled from many sources. It combines the advantages of a modern survey of the field with the entertaining style of the old-fashioned "natural histories" we read in our childhood days. A wealth of illustrations fills its pages, taken from various sources; most of them are familiar and duly credited. A few colored plates are added to illustrate certain striking species. The author has purposely avoided matters dealing with evolutionary theories, his purpose being in general to present a picture of the animal world of to-day in its many and complex relations and modifications.

Naturally in a work of this scope it has not been possible to treat any of the various aspects of environment in more than a brief and cursory way and the passages dealing with mammals might have been greatly amplified, but it does nevertheless bring together in small compass a great store of facts so arranged as to present a fair perspective of the conditions and major factors implied in the general term "environment," and the diverse ways in which unrelated animals have adapted themselves to the same sets of conditions.

Especially interesting are the pages dealing with parasitic life, as reviewing the results of more recent study: the different steps by which organisms pass from an independent existence to one of symbiosis, of commensalism, or of final complete dependence on one or more hosts. The internal parasites causing "disease," transmitted from one organism to another, may be of enormous importance in the evolutionary history of other species. It is well known that the presence of certain biting flies (*Glossina*) that carry the trypanosome of the *nagana* disease, make the use of horses nearly impossible in certain parts of Africa and thus form a natural barrier to an extension of range that is more efficient than a mountain-chain. Conversely, the accidental introduction of the Texas fever, a tick-borne disease, into South Africa resulted at one time in the destruction of vast numbers of antelope and cattle. Osborn, commenting on the discovery in the Colorado shales of a fossil fly apparently of the same genus as the African *Glossina*, has suggested that the former presence of this bearer of blood parasites may have

had a part in the extinction of certain ungulates formerly abundant in North America.

Altogether the book is a convenient and interesting summary that should not only prove attractive to the general reader but valuable as well to the teacher who wishes to instill in his students a knowledge and love of natural history as well as of "zoology."

—*Glover M. Allen.*

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Ahrens, Theodor G. Proposals for the preservation of the European bison, or wisent. Zool. Soc. Bull., vol. 26, pp. 46–50; 3 figs. May, 1923.

Ashbrook, Frank G. Silver-fox farming. U. S. Dept. Agric. Bull. 1151; 60 pp., 46 figs. June 20, 1923.

Bailey, Harold H. A new fox squirrel from the Eastern Shore of Maryland. Bull. no. 1, Bailey Mus. and Lib. Nat. Hist., Newport News, Va. 1 page. August 1, 1920. (Describes *Sciurus niger bryanti* from Dorchester County, Maryland.)

Beddard, Frank E. On the blow-holes and nasal passages of the cachalot (Physeter macrocephalus). Ann. and Mag. Nat. Hist., ser. 9, vol. 11, pp. 641–655. June, 1923.

Cabrera, Angel. Los Murinæ de Marruecos. R. Soc. Esp. de Hist. Nat., Tomo del 50.° aniv., pp. 42–58. March 15, 1921. (New forms of *Mus* and *Rattus*.)

——— Algunos carnívoros africanos nuevos. Bol. R. Soc. Española Hist. Nat., vol. 21, pp. 261–264. June–July, 1921. (New forms of *Genetta*, *Atilax*, and *Thos*.)

——— Sobre algunos mamíferos de la China oriental. Bol. R. Soc. Española Hist. Nat., vol. 22, pp. 162–170. March, 1922. (New forms of *Mus*, *Rattus*, and *Microtus*.)

——— Sobre algunas formas del género Mustela. VI.—El armiño del Africa del Norte. Bol. R. Soc. Española Hist. Nat., vol. 23, pp. 23–34. January, 1923.

——— Las formas locales de Anomalurus fraseri. Bol. R. Soc. Española Hist. Nat., vol. 23, pp. 68–69. February, 1923.

Dighton, Adair. Coat colour in greyhounds. Proc. Zool. Soc. London, 1923, pt. 1, pp. 1–9. April, 1923.

Gillespie, T. H. Annual report of the Zoological Society of Scotland for the year ending 31st March 1923. 24 pp., 8 plates. 1923.

Gudger, E. W. Monkeys trained as harvesters. Instances of a practice extending from remote times to the present. Nat. Hist., vol. 23, pp. 272–279; 4 figs. May–June, 1923.

Hartman, Carl. Breeding habits, development, and birth of the opossum. Ann. Rep. Smithsonian Inst., 1921, pp. 347–363, 10 plates. 1923.

Hay, Oliver P. Description of a new fossil sea cow from Florida, Metaxytherium floridanum. Proc. U. S. Nat. Mus., vol. 61, art. 17, 4 pp., 1 plate. May 3, 1922.

——— The Pleistocene of North America and its vertebrated animals from the states east of the Mississippi River and from the Canadian Provinces east of longitude 95°. Publ. 322 Carnegie Inst. Washington, pp. i-viii; 1–499; 41 plates; 25 text figs. February, 1923.

HILL, J. P. AND R. H. BURNE. The fetal membranes and placentation of Chiromys madagascariensis. Proc. Zool. Soc. London, 1922, pt. 4, pp. 1145–1165, plates 6. February, 1923.

HOLMES, SAMUEL J. A tentative classification of the forms of animal behavior. Journ. Comp. Psychol., vol. 2, pp. 173–186. June (August), 1922.

HOWELL, A. BRAZIER. Agencies which govern the distribution of life. Amer. Nat., vol. 56, pp. 428–438. September–October, 1922.

HOY, CHARLES M. The "white-flag" dolphin of the Tung Ting Lake. China Journ. Sci. and Arts, vol. 1, pp. 154–157, 1 plate. March, 1923.

HUNTER, WALTER S. Habit interference in the white rat and in human subjects. Journ. Comp. Psychol., vol. 2, pp. 29–50. February (March), 1922.

JACOBI, ARNOLD. Die Rüsselbildung bei Säugetieren der Gegenwart und Vorzeit. Jenaische Zeitschr. f. Nat., 57 Bd., Neue Folge, 50 Bd., pp. 199–218; 8 figs. 1921.

KELLOGG, REMINGTON. Description of an apparently new toothed cetacean from South Carolina. Smithsonian Misc. Coll., vol. 76, no. 7, pp. 1–7; 2 plates. July 25, 1923.

KERSHAW, P. S. Æthiosciurus vexillarius and Æ. byatti. Ann. and Mag. Nat. Hist., ser. 9, vol. 11, p. 708. June, 1923. (These species were erroneously described in the genus *Funisciurus*.)

LESOUEF, A. S. The Australian native animals. How they stand to-day, and the cause of the scarcity of certain species. Australian Zool., vol. 3, pt. 3, pp. 108–111; 1 plate. June 7, 1923.

LOEB, LEO. The parthenogenetic development of eggs in the ovary of the guinea pig. Science, n. s., vol. 58, pp. 35–36. July 13, 1923.

LÖNNBERG, EINAR. Remarks on some Palearctic bears. Proc. Zool. Soc. London, 1923, pt. 1, pp. 85–95, plates 2. April, 1923.

M'INTOSH, PROF. Notes from the Gatty Marine Laboratory, St. Andrews. Ann. and Mag. Nat. Hist., ser. 9, vol. 12, pp. 65–94, 2 plates. July, 1923. (Includes notes on rabbits and whales.)

MITCHELL, P. CHALMERS. Official guide to the gardens of the Zoological Society of London. Twenty-first edition; 110 pp., many illustr. London. 1923.

MONTAGU, IVOR G. S. On a further collection of mammals from the Inner Hebrides. Proc. Zool. Soc. London, 1922, pt. 4, pp. 929–941. February, 1923. (New subspecies: *Apodemus hebridensis tiræ, A. h. ghia, A. h. tural, A. h. larus*, and *Microtus agrestis fiona*.)

NICHOLLS, EDITH E. A study of the spontaneous activity of the guinea pig. Journ. Comp. Psychol., vol. 2, pp. 303–330. August (October), 1922. (Of general interest from the stanupoint of methods.)

OSBORN, HENRY FAIRFIELD. The extinct giant rhinoceros Baluchitherium of western and central Asia. Nat. Hist., vol. 23, pp. 209–228; 17 figs. May–June, 1923.

——— Ancient fauna of Mongolia discovered by the Third Asiatic Expedition of the American Museum of Natural History. Science, n.s., vol. 57, pp. 729–732. June 29, 1923.

PETRONIEVICS, BRANISLAV. Remarks upon the skulls of Mœritherium and Palæomastodon. Ann. and Mag. Nat. Hist., ser. 9, vol. 12, pp. 55–61, 1 plate, 2 figs. July, 1923.

Pocock, R. I. On the external characters of a fœtal Chiromys. Proc. Zool. Soc. London, 1922, pt. 4, pp. 1165–1170. February, 1923. (Written as an appendix to Hill and Burne's paper, noted above.)

——— On the external characters of the beaver (Castoridæ) and of some squirrels (Sciuridæ). Proc. Zool. Soc. London, 1922, pt. 4, pp. 1071–1212. February, 1923.

——— On the feet and rhinarium of the polar bear. Proc. Zool. Soc. London, 1923, pt. 1, pp. 159–160. April, 1923.

Ridgway, Robert. Some observations on the natural history of Costa Rica. Ann. Rep. Smithsonian Inst., 1921, pp. 303–324; 5 plates. 1923.

Sonntag, Charles F. On the myology and classification of the wombat, koala, and phalangers. Proc. Zool. Soc. London, 1922, pt. 4, pp. 863–896. February, 1923.

——— On the vagus and sympathetic nerves of the terrestrial Carnivora. Proc. Zool. Soc. London, 1923, pt. 1, pp. 65–83. April, 1923.

——— The comparative anatomy of the tongues of the Mammalia. VIII. Carnivora. Proc. Zool. Soc. London, 1923, pt. 1, pp. 129–153. April, 1923.

Sowerby, Arthur deCarle. The blue sheep of Kansu. China Journ. Sci. and Arts, vol. 1, pp. 158–160. March, 1923.

Stone, Calvin P. The congenital sexual behavior of the young male albino rat. Journ. Comp. Psychol., vol. 2, pp. 95–153. April (May), 1922.

Sumner, F. B. Studies of subspecific hybrids in Peromyscus. Proc. Nat. Acad. Sci., vol. 9, no. 2, pp. 47–52. February, 1923.

——— Some facts relevant to a discussion of the origin and inheritance of specific characters. Amer. Nat., vol. 57, pp. 238–254. May–June, 1923.

Teh, Wu Lien. The tarbagan or Siberian marmot. Researches into their relation with bubonic plague in man. China Journ. Sci. and Arts, vol. 1, pp. 39–50; 1 plate. January, 1923.

Thomas, Oldfield. On mammals from the Li-kiang Range, Yunnan, being a further collection obtained by Mr. George Forrest. Ann. and Mag. Nat. Hist., ser. 9, vol. 11, pp. 655–663. June, 1923. (New forms of *Crocidura*, *Nyctereutes*, *Trogopterus*, and *Ochotona*.)

——— A new short-tailed opossum from Marajó, Amazonia. Ann. and Mag. Nat. Hist., ser. 9, vol. 12, p. 157. July, 1923. (Describes *Monodelphis maraxina* from Marajó Island, mouth of Amazon.)

——— On the ring-tailed phalanger of South Australia, and and a new rat from North Queensland. Ann. and Mag. Nat. Hist., ser. 9, vol. 12, pp. 158–160. July, 1923. (New forms each of *Pseudochirus* and *Rattus*.)

——— Geographical races of Petaurista alborufus. Ann. and Mag. Nat. Hist., ser. 9, vol. 12, pp. 171–172. July, 1923. (Two new subspecies from China.)

——— Notes on some spiny mice (Acomys). Ann. and Mag. Nat. Hist., ser. 9, vol. 12, pp. 173–174. July, 1923. (New forms from Aden district and Somaliland.)

Vevers, G. M. On the parasitic Nematoda collected from mammalian hosts which died in the gardens of the Zoological Society of London during the years 1919–1921; with a description of three new genera and three new species. Proc. Zool. Soc. London, 1922, pt. 4, pp. 901–919. February, 1923.

——— On the cestode parasites from mammalian hosts which died in the gardens of the Zoological Society of London during the years 1919–1921; with a description of a new species of Cyclorchida. Proc. Zool. Soc. London, 1922, pt. 4, pp. 921–928. February, 1923.

## AMERICAN SOCIETY OF MAMMALOGISTS

### Articles of Incorporation[1]

This is to Certify, That we whose names are hereto subscribed, citizens of the United States and a majority of whom are citizens of the District of Columbia, have associated ourselves together pursuant to the provision of Sub-Chapter III of Chapter XVIII, of the Code of Law for the District of Columbia, and all acts amendatory thereof, as an Association and body corporate, to be known by the corporate name of the American Society of Mammalogists, the term of which shall be perpetual.

The particular objects and business of this Society shall be the promotion of the study of mammalogy by the publication of a serial and other publications, by aiding research, and by engaging in such other activities as may be deemed expedient.

The affairs, funds and property of the corporation shall be under the control and management of a Board of Directors, consisting for the first year of seventeen members, but thereafter this number may be increased or decreased as the by-laws of the corporation may provide from time to time.

The right is reserved to alter or amend this certificate in the manner now or hereafter provided by law.

*In Witness Whereof*, the parties hereto have hereunto set their hands and seals this 29th day of April, A.D. 1920.

| | |
|---|---|
| C. Hart Merriam | (Seal) |
| E. W. Nelson | (Seal) |
| Vernon Bailey | (Seal) |
| Hartley H. T. Jackson | (Seal) |
| Clarence R. Shoemaker | (Seal) |
| Chas. W. Richmond | (Seal) |
| Victor J. Evans | (Seal) |

District of Columbia, ss:

Before me, a Notary Public personally appeared C. Hart Merriam, E. W. Nelson, Vernon Bailey, Hartley H. T. Jackson, Clarence R. Shoemaker, Chas. W. Richmond and Victor J. Evans, personally well known to me to be the persons whose names are subscribed to the foregoing certificate of incorporation, dated the 29th day of April 1920, and each for himself and not for the other acknowledged said certificate to be voluntarily made, signed and acknowledged by him as and for his act and deed.

*In Witness Whereof*, I have hereunto set my hand and affixed my official seal, this 29th day of April, 1920.

Berenice H. Broy,
*Notary Public, D. C.*

(Notarial Seal)

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[1] The Articles of Incorporation of the Society never having been printed, they are here, together with the Temporary By-laws adopted by the incorporators, printed in the Journal as a matter of record. The revised by-laws and rules of the Society, as amended at the last annual meeting, will be printed in the next issue.

*Office of the Recorder of Deeds,*
*District of Columbia.*

THIS IS TO CERTIFY that the foregoing is a true and verified copy of the Certificate of Incorporation of the "American Society of Mammalogists" and of the whole of said Certificate of Incorporation, as filed in this office the 29th day of April, A.D. 1920.

*In Testimony Whereof,* I have hereunto set my hand and affixed the seal of this Office this 29th day of April, A.D. 1920.

R. W. DUTTON,
*Deputy Recorder of Deeds, D. C.*

(Recorder of Deeds Seal)

## AMERICAN SOCIETY OF MAMMALOGISTS

### TEMPORARY BY-LAWS

(Adopted by Incorporators, April 29, 1920)

#### ARTICLE I. NAME AND OBJECT

*Sec. 1.* This society shall be known as the American Society of Mammalogists.

*Sec. 2.* The object of the Society shall be the promotion of the interests of mammalogy.

#### ARTICLE II. MEMBERSHIP

*Sec. 1.* Any person who shall receive a two-thirds vote of the Incorporators may become a member of the Society.

#### ARTICLE III. OFFICERS AND DIRECTORS

*Sec. 1.* The Officers and Directors shall be elected annually by the Society at large.

#### ARTICLE IV. AMENDMENTS

*Sec. 1.* These By-Laws may be amended without notice at any meeting by a two-thirds vote of the members present.

(Signed)

VICTOR J. EVANS
E. W. NELSON
CHAS. W. RICHMOND
C. HART MERRIAM
VERNON BAILEY
CLARENCE R. SHOEMAKER
HARTLEY H. T. JACKSON

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